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ORGANIC CONTAMINANTS: A BIBLIOGRAPHY

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INTRODUCTION

The Lawrence Berkeley Laboratory, with the support of the Department of Energy, has developed a computerized database to manage research information in the area of building ventilation and indoor air quality. This literature survey contains references from the database pertaining to the following research areas: laboratory techniques for analyzing formaldehyde, methodologies for identifying and characterizing a wide variety of organic contaminants, and selected field studies of organic contaminants in indoor air. The objective of this report is to disseminate the bibliographic references compiled for that portion of the program related to organic contaminants. Interested database users are encouraged to contact the laboratory to receive instructions for direct access to the database. A flyer describing the database is supplied at the end of the bibliography and a brief overview of the Organic Contaminant Program is given below.

ORGANIC CONTAMINANT PROGRAM AT LBL

Studies by the Lawrence Berkeley Laboratory and other research institutions indicate that the levels of organic contaminants in indoor environments often exceed those encountered outdoors. Organic contaminants derive from a variety of sources: formaldehyde can be emitted from common building materials such as plywood, particleboard and foam insulation (all of which contain urea-formaldehyde resins), and a wide range of organic contaminants are emitted from such materials as paints or adhesives as well as from combustion processes associated with occupant behavior and appliances.

It is generally accepted that the buildup of organic compounds in indoor environments can have adverse effects on the health or comfort of occupants. Organic compounds such as aromatic and chlorinated hydrocarbons that we have encountered in field tests are capable of inducing acute toxic effects when present in high concentrations. Even at lower levels of exposure, some of the compounds may have an adverse effect by virtue of their carcinogenic activity.

Although methodologies exist for sampling outdoor air or occupational indoor air and for performing subsequent analysis in the laboratory, present capabilities are somewhat limited with respect to testing sensitivity and the range of compounds present in the air. For many contaminants, precise quantitative measurement is difficult at low concentration levels, and instruments for continuous monitoring of organic contaminants in indoor environments do not exist. A major objective of the Organics Contaminants Project has been to develop an overall methodology that will encompass both field sampling and laboratory analyses.

1. Aldrich Chemical Company, Inc. (Milwaukee, WI)
Technical information: 3-methyl-2-benzothiazolinone hydrazone (MBTH) hydrochloride monohydrate. 2 p.

2. Aldrich Chemical Company, Inc. (Milwaukee, WI)
Technical information: Purpald (4-amino-3-hydrazino-5-mercapto-1,2,4-triazole). 2 p., 12/--/71.

3. American Society for Testing and Materials. (Philadelphia, PA)
Standard test method for rate of air leakage through exterior windows, curtain walls and doors. Standard ANSI/ASTM E-283-73, 1973.

ABSTRACT: The method discussed in this paper covers the determination of the resistance of exterior windows, curtain walls and doors to air infiltration resulting from air pressure differences. The test consists of sealing a test specimen into or against one face of an air chamber, supplying air to or exhausting air from the chamber at the rate required to maintain the specified test pressure differences across the specimen, and measuring the resultant air flow through the specimen. Aspects of this method may be applicable to the study of air exchange rates in structures which are major determining factors in the infiltration of pollutants outdoors into the indoor environment, and of exfiltration of indoor pollutants to the outdoors.

4. Battelle Columbus Laboratories
Final report on health effects of formaldehyde to National Particleboard Association. 38 p., 07/29/77.

5. Chicago Department of Environmental Control. (Chicago, IL)
Indoor-outdoor carbon monoxide concentration within the City of Chicago central business district., 1973.

ABSTRACT: The objective of this survey is to acquire carbon monoxide data within the central business district of the City of Chicago to determine if relationships can be established between indoor and outdoor levels and to determine if other factors that influence indoor concentrations can be identified. It was found that ambient carbon monoxide levels control the air quality inside a building as based on factors such as indoor activities, meteorological conditions, and natural ventilation, location, time, and air system. However, the effect of influencing factors is not fully understood. General indoor-outdoor pollutant relationships are presented.

6. Energy Conservation Digest. (Washington, D.C.)
UF foam hit on several fronts.
ENERGY CONSERV. DIG. 1(24): 1,3-5, 12/25/78.

ABSTRACT: The urea formaldehyde foam insulation industry is fighting for its economic life again following recent developments on several fronts. These include a lawsuit, a health warning and the threat of removing UF foam from a list of materials qualifying for residential energy tax credits. UF foam's problems have been two-fold: the release of formaldehyde gas as well as shrinkage after the material has been installed into walls of houses.

7. Environmental Health Associates, Inc. (Berkeley, CA)
Health effects of diesel exhaust emissions: A comprehensive literature review, evaluation

and research gaps analyses. 186 p., 1978.

ABSTRACT: The literature presents general and varied information on benzo-a-pyrene and other polynuclear aromatic hydrocarbons as they relate to diesel exhaust emission. The most scientifically valid information on the association between polynuclear aromatic hydrocarbon (PAH) compounds and cancer is available from the workplace environment. Levels of BaP in the United Kingdom gas work industries were found as high as 216,000 micrograms/1000 cubic meters above the horizontal retorts. Similar levels have been estimated in the United States at topside locations of coke ovens. In properly ventilated coal mines, the levels of BaP were estimated to be no worse than levels in urban ambient air. But, as yet, the importance of any reaction between BaP and coal dust has not been determined.

8. Federal Aviation Administration. (Washington, D.C.), Department of Transportation. (Washington, D.C.), National Institute for Occupational Safety and Health. (Morgantown, WV)

Health aspects of smoking in transport aircraft., 12/--/71.

ABSTRACT: The FAA, DOT, and NIOSH jointly studied the health aspects of smoking in aircraft. The study involved the collection of samples of carbon monoxide, particulate matter, polynuclear hydrocarbons, ammonia and ozone to determine environmental exposure. Polynuclear hydrocarbons were detected by the thin layer chromatography technique used to analyze the particulate samples. Benzo-a-pyrene (BaP) was one of the compounds analyzed. It was also the only hydrocarbon identified on the filters. BaP concentrations found in the aircraft environment, although only a fraction of 1 microgram/cubic meter, exceeded those reported from typical U.S. urban areas.

9. National Academy of Sciences. Space Science Board. (Washington, D.C.)

Atmospheric contaminants in spacecraft: Report of the Panel on Air Standards for Manned Space Flights. 86 p., 1968.

ABSTRACT: The likelihood of adverse effects from air contaminants on the health or performance of spacecraft crews on prolonged missions was examined. Subsequently, the charge was expanded to include consideration of limits for brief exposure to air contaminants under emergency conditions. The panel collected available data on potential contaminants in spacecraft from a variety of sources. These data were based on measurements in spacecraft, simulated spacecraft studies, and outgassing experiments on components and subsystems. Some 200 possible contaminants were identified. Long-term limits recommended were chosen with the objective of avoiding (1) adverse health effects, either immediate or delayed, (2) degradation of performance, and (3) interference with physiological studies on crew members. The 60-minute emergency limits were designed to avoid significant degradation in crew performance in emergencies and to avoid permanent health injury. They contain essentially no safety factor, and transitory effects may result. Certain research needs emerge as a result of the study. They are outlined in the text.

10. Radian Corporation (Austin, TX)

HAOS aldehydes monitoring program. 27 p., 04/14/78.

ABSTRACT: One-hour samples were collected for total aldehydes and formaldehyde analysis at two sites in Houston from 5 a.m. to 5 p.m. (CDT) during the period from August 3 to October 13, 1977. Additionally, 3-hour samples were taken four times a day for a ten-day period at each site and analyzed for C2-C6 aldehydes on a gas chromatograph. Of the 295 samples analyzed for total aldehydes at Aldine, 65 percent were below the minimum detectable levels, while 94 percent of the formaldehyde samples at Aldine were below the minimum detectable levels. Of the 353 samples from Fuqua analyzed for total aldehydes, 58 percent were below the minimum detectable levels, and 96 percent of the 255 samples analyzed for formaldehyde at Fuqua were below the minimum detectable levels. The maximum value reported for total aldehydes is 63 micrograms per cube meter measured at Aldine. The highest formaldehyde value reported is 16 micrograms per cube meter at Aldine.

11. U.S. Department of Health, Education, and Welfare, Public Health Service, Health Services and Mental Health Administration. (Rockville, MD)

Public exposure to air pollution from tobacco smoke.

THE HEALTH CONSEQUENCES OF SMOKING: A REPORT OF THE SURGEON GENERAL., 1972.

ABSTRACT: The purpose of this work is to summarize the present state of evidence concerning the effects of exposure to an atmosphere containing either tobacco smoke or its constituents. The identification of cigarette smoking as a serious health hazard to the smoker was based on clinical and epidemiological observations that nonsmokers have much lower mortality and morbidity rates from a number of conditions. It is obvious, therefore, that cigarette smoking is normally a greater hazard to the smoker than is the typical level of exposure to air pollutants produced by the smoking of cigarettes which many nonsmokers experience. This would be consistent with the voluminous data which show a dose-response relationship between the level of exposure to smoke and the magnitude of its effect. The research so far reported on the nature and effects of exposure to smoke-pollutants in the atmosphere has not been as extensive and well-controlled as that done on the health effects of smoking on the smoker himself. Knowledge on this subject can be separated into four major areas of concern: 1) the extent to which the components of cigarette smoke contaminate the atmosphere and are absorbed by the nonsmoker, 2) the effects of low levels of carbon monoxide on human health, 3) allergic, adverse, and irritative reactions to cigarette smoke among nonsmokers, 4) the known harmful effects of the passive inhalation of cigarette smoke in animals.

12. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards. Air Pollution Technical Information Center. (Research Triangle Park, NC)

Air pollution aspects of emission sources: Surface coatings--their production and use. A bibliography with abstracts. EPA Report No. 450/1-74-005, 1974.

ABSTRACT: The Air Pollution Technical Information Center of the Office of Air Quality Planning and Standards prepared, selected, and compiled the approximately 235 abstracts in this bibliography. The abstracts are arranged within two categories listed in the Contents. The abstracted documents are thought to be representative of available literature, and no claim is made to all-inclusiveness. The included abstracts deal with emission sources, control measures, measurement methods, air quality measurements, atmospheric interaction, basic science and technology, effects on human health, plants, livestock, standards and criteria, legal and administrative issues and social aspects.

13. U.S. Environmental Protection Agency. Office of Radiation Programs.

Preliminary findings: Radon daughter levels in structures constructed on reclaimed Florida phosphate land. Technical Note ORP/CSD-75-4, 1975.

ABSTRACT: This report presents preliminary findings from the evaluation of reclaimed land used for residential and other structures in Florida. A comprehensive study was conducted on the release of radiation and radioactive materials from phosphate mining, processing, use and related activities of industry. The effectiveness of present standards and controls was also determined. In areas where such controls seem inappropriate, other guides and standards will be developed. Using a sample of approximately 125 structures, gamma surveys of each structure were taken to determine the significance of radium-226 in reclaimed land on the radon daughter levels. The data from this study combined with existing information indicate that radium-226 concentrations in soil beneath the structures significantly affect radon daughter levels within the structures.

14. Adams, J., Menzies, K., Levins, P.

Selection and evaluation of sorbent resins for the collection of organic compounds. EPA-600/7-77-044 52 p.

ABSTRACT: This report gives results of an experimental program to characterize the behavior of resins which can be used in the sorbent trap module of a sampling train used for environmental assessment studies. Experimental design considerations were based on the sorbent canister in the new source assessment sampling system (SASS) train. Both XAD-2 and Tenax-GC resins were studied. Investigated compounds represented both a regular homologous series and compounds of direct interest to shipboard incineration studies. Two experimental approaches were used: a gas chromatography method using elution analysis to determine volumetric capacity (V_g) at low pollutant concentrations; and a steady state apparatus for frontal analysis to determine weight capacities of the resins. The studies showed that XAD-2 has a greater volumetric and weight capacity than Tenax-GC and is, therefore, preferred for use in the SASS train sorbent canister. A regular relationship was observed

between the capacity of the resin and the volatility of the compounds studied. Under normal SASS train sampling conditions, materials such as POMs, PCBs, and Agent Orange would be completely retained by either the XAD-2 or Tenax-GC resin.

15. Afshan, B. K., Kulkarni, A. V., Ryan, J. F.

Determination of nanogram quantities of carbonyl compounds using twin cell potential sweep voltammetry.

ANAL. CHEM. 47(3): 488-494, 03/--/75.

ABSTRACT: Twin cell potential sweep voltammetry is used to determine and differentiate various classes of carbonyl compounds in natural waters and industrial effluents. A systematic study of polarographic behavior of these compounds in various media, such as alkaline medium, citrate buffer, and in the presence of various amines, is reported. It is possible to detect and distinguish various classes of carbonyl compounds using the above media. Individual carbonyl compounds can also be determined down to 0.25 micrograms/liter without any separation or preconcentration of the sample. The above method is applied to determine various carbonyl compounds in natural waters and industrial effluents.

16. Alarcon, R. A.

Fluorometric determination of acrolein and related compounds with *m*-aminophenol.

ANAL. CHEM. 40(11): 1704-1708, 1968.

17. Altshuller, A. P., Cohen, I. R., Meyer, M. E., Wartburg, A. F.

Analysis of aliphatic aldehydes in source effluents and in the atmosphere.

ANAL. CHIM. ACTA 25: 101-117, 1961.

18. Altshuller, A. P., Miller, D. L., Sleva, S. F.

Determination of formaldehyde in gas mixtures by the chromotropic acid method.

ANAL. CHEM. 33(4): 621-625, 04/--/61.

19. Altshuller, A. P., Leng, L. J., Wartburg, A. F.

Source and atmospheric analyses for formaldehyde by chromotropic acid procedures.

AIR WATER POLLUT. 6: 381-385, 1962.

20. Altshuller, A. P., McPherson, S. P.

Spectrophotometric analysis of aldehydes in the Los Angeles atmosphere.

J. AIR POLLUT. CONTROL ASSOC. 13(3): 109-111, 1963.

21. Altshuller, A. P., Leng, L. J.

Application of the 3-methyl-2-benzothiazolone hydrazone method for atmospheric analysis of aliphatic aldehydes.

ANAL. CHEM. 35(10): 1541-1542, 09/--/63.

22. Altshuller, A. P., Kopczynski, S. L., Lonneman, W., Wilson, D.

Photochemical reactivities of exhausts from 1966 model automobiles equipped to reduce hydrocarbon emissions.

J. AIR POLLUT. CONTROL ASSOC. 17(11): 734-737, 1967.

23. Alzona, J., Cohen, B. L., Rudolph, H., Jow, H. N., Frohlinger, J. O.

Indoor-outdoor relationships for airborne particulate of outdoor origin.

ATMOS. ENVIRON., 1978.

ABSTRACT: The air in a room was cleaned, and then airborne particulate matter was collected for various subsequent time intervals simultaneously in the room and outdoors nearby by pumping air through filters; the filters were analyzed by X-ray excitation for elements known to be primarily of outdoor origin (Fe, Zn, Pb, Br, Ca). Within several hours an equilibrium is reached in which the indoor-outdoor ratio is typically 0.3. A model is developed incorporating filtration in passing through walls, and deposition on, and resuspension from surfaces in the room. Experiments were carried out with windows "cracked" open and wide open, and with windows and/or other room surfaces covered with plastic sheet to determine the importance of various terms. Several rooms of various types and two automobiles were studied and it is concluded that a person remaining indoors with doors and windows partially closed probably inhales no more than one-third as much dust of outdoor origin as he would if he were outdoors.

24. Andersen, I.

Technical notes: Relationships between outdoor and indoor air pollution.

ATMOS. ENVIRON. 6: 275-278, 1971.

ABSTRACT: This paper looks at the modifications of pollutants during the passage from outdoors to indoors. Paired 24-hour samples of sulfur dioxide and suspended particulate matter (TSP) were studied outside and inside a room over a 7-1/2 month period in Denmark. Sulfur dioxide was determined by spectrophotometric analysis and TSP was measured with an E.E.L. reflectometer. Indoor sulfur dioxide and TSP concentrations were, on the average, 51 and 69 percent, respectively, of the simultaneous outdoor values. For both pollutants, the coefficients of correlation between indoor and outdoor values were 0.52 and 0.83, respectively. The factors which determine the concentrations of a pollutant in a room are discussed, and the author stresses the medical-hygienic importance of increasing the effects of building materials in reducing pollution.

25. Andersen, I., Lundqvist, G. R., Molhave, L.

Liberation of formaldehyde from particleboard under controlled conditions in a climate chamber.

UGESKR. LAEGER 136(38): 2140-2145, 1974.

ABSTRACT: This article deals with experimental work relevant to "Formaldehyde in the atmosphere of Danish homes," by Andersen. Further confirmation is given of the fact that the evolution of formaldehyde increases when both higher temperatures and humidity are present.

26. Andersen, I., Lundqvist, G. R., Molhave, L.

Formaldehyde in the atmosphere in Danish homes.

UGESKR. LAEGER 136(38): 2133-2139, 1974.

ABSTRACT: In this study, the formaldehyde content of 25 rooms in 23 new or recent single-family homes was measured. An indoor average of 0.62 milligrams/cubic meter air, with a range of 0.08 to 2.24 milligrams/cubic meter was found. In 17 rooms, the observed value was higher than the desired 0.40 milligrams/cubic meter for long-term exposure. Under these circumstances, the authors presumed that occupants would experience upper respiratory effects such as lowered mucociliary rate of transport, lower transport, lower threshold for smell, increased airway resistance, and irritation of the mucosa in the nose

and conjunctiva.

27. Andersen, I., Lundqvist, G. R., Molhave, L.

Liberation of formaldehyde from particleboard: Mathematical model.

UGESKR. LAEGER 136(38): 2145-2150, 1974.

ABSTRACT: A mathematical model was derived based on experimental measurements of aldehydes in a climate chamber. By introducing a correction factor the model was adapted to actual dwellings, permitting estimation of an anticipated value for the equilibrium concentration of formaldehyde for a given room.

28. Andersen, I., Lundqvist, G. R., Molhave, L.

Indoor air pollution due to chipboard used as a construction material.

ATMOS. ENVIRON. 9(12): 1121-1127, 1975.

ABSTRACT: Chipboard (particle board) is a common building construction material made of wood-shavings held together with a urea formaldehyde glue. Due to this composition there is a continuous emanation of formaldehyde from chipboard. Measurements in 25 rooms in 23 Danish dwellings where chipboard was used in walls, floors and ceilings showed that the average concentration exceeded the German threshold limit for occupational exposure in outdoor air. A mathematical model for the room air concentration of formaldehyde is given. The adverse health effects of low levels of formaldehyde are irritation of the upper airways and conjunctivitis. The need for air quality standards and control programmes for indoor air in the home is stressed.

29. Andersen, I.

Formaldehyde in the indoor environment: Health implications and the setting of standards.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: Exposure to formaldehyde vapor causes irritation especially of the eyes and upper airways; skin irritation may occur. The background concentration in outdoor air is about 0.05 milligrams/cubic meter. Indoor concentrations up to 1-2 milligrams/cubic meter have been found in rooms with emanations from construction materials made of resins. The literature on the biological effects of formaldehyde is reviewed, and the results of an exposure of 16 young healthy subjects to 0.3, 0.5, 1.0 or 2.0 milligrams formaldehyde/cubic meter air during 5 hours are described. There was no change in airway resistance. The odor threshold (ethyl valerate) was increased at 2.0 milligrams/cubic meter. A small decrease in nasal mucus flow was found in the first part of the nose at all concentrations except 1.0 milligrams/cubic meter. Eye irritation and dryness in the nose and throat was experienced by three subjects at 0.3 and by 15 at 1.0 milligrams/cubic meter. There was no change in performances. A standard for continuous exposure protecting all but subjects sensitized to formaldehyde against any adverse health effect and the majority of the subjects against discomfort is suggested at 0.15 milligrams formaldehyde/cubic meter air.

30. Andrawes, F. F., Gibson, E. K., Jr.

Simultaneous determination of trace amounts of hydrogen, oxygen, nitrogen, carbon, monoxide, carbon dioxide, methane, ethane, ethylene, and acetylene by two gas chromatographic columns in parallel and one detector.

ANAL. CHEM. 51(3): 462-463, 03/--/79.

31. Ashes, J. R., Haken, J. K.

The effect of temperature on the retention behaviour and polarity of several polysiloxane stationary phases.

ABSTRACT: The effect of temperature on the polarity classification involving five terms as defined by Rohrschneider was examined. It was found that the retention behaviour of the standard substances used to define this polarity classification, as well as the polarity of the several polysiloxane stationary phases used, varied linearly with temperature over a limited temperature range.

32. Aue, W. A., Teli, P. M.

Sampling of air pollutants with support-bonded chromatographic phases.

J. CHROMATOGR. 62(1): 15-27, 10/28/71.

ABSTRACT: Support-bonded silicones, such as $(C_{18}H_{37}(SiO_2)_{3/2})_n$ on various types of Chromosorb, can be used to trap organic vapors from the atmosphere. The trapped compounds can then be extracted and the concentrated extracts analyzed by various analytical techniques.

33. Aue, W. A., Hastings-Vogt, C. R., Younker, D. R.

A gas chromatographic cartridge desorption port.

J. CHROMATOGR. 114(1): 184-189, 11/12/75.

ABSTRACT: In the course of studies on the efficiency of solid media for the collection of trace vapors in the atmosphere, it became necessary to devise a suitable cartridge system for sample acquisition, transport and introduction into a gas chromatograph for analysis. The collection media to be tested were solid materials, either bare or with a polymer layer bonded to their surface. Although collected compounds could be removed easily by liquid extraction, heat desorption was used for the purposes of this study: it is faster, more sensitive and much more prone to decompose collected compounds. While the latter would be considered a disadvantage in actual sampling, it is valuable in a testing program to establish the catalytic activity of collection phases.

34. Ayres, S. M

Patient advice during acute air pollution episodes.

ARCH. ENVIRON. HEALTH 22: 591-592, 1971.

ABSTRACT: A relationship between certain respiratory disorders and illnesses and atmospheric pollution has been documented in recent years. It has been found that the health of patients with chronic obstructive lung diseases was impaired by exposure to pollutants in the ambient environment. The irritant potential of the atmosphere increased even further during thermal inversions and decreased windspeed. The author of this paper suggests three methods of prevention to protect sensitive individuals from irritating pollutants and to prevent exacerbation of disease. They are: 1) protection of the patient from environmental influences, 2) prophylactic treatment with antibiotics, and 3) increased use of therapeutic techniques. The maintenance of a healthy indoor environment is important but difficult to achieve, for one cannot eliminate pollutant concentration by simply closing the windows. The presence of several types of pollutants indoors has to be a major concern. Additionally, a higher indoor humidity level forms droplets of water vapor which may react chemically with pollutant gases.

35. Bailey, B. W., Rankin, J. M.

New spectrophotometric method for determination of formaldehyde.

ANAL. CHEM. 43(6): 782-784, 05/--/71.

36. Banaszak, E. F., Thiede, W. H., Fink, J. N.

Hypersensitivity pneumonitis due to contamination of an air conditioner.

ABSTRACT: This report presents the authors' studies of a hypersensitivity pneumonitis occurring in office workers exposed to a thermophilic actinomycete seemingly unassociated with a specific organic dust and contaminating the air conditioning system supplying their office. In 4 of 27 workers, the symptoms of intermittent chills, fever and dyspnea were experienced. Although this study deals with a fairly uncommon irritant present in the indoor environment, it confirms the possibility of the growth of some unhealthy organisms under certain conditions in the indoor settings.

37. Barber, E. D., Lodge, J. P., Jr.

Paper chromatographic identification of carbonyl compounds as their 2,4-dinitrophenylhydrazones in automobile exhaust.

ANAL. CHEM. 35: 348-350, 1963.

38. Bartle, K. D., Bergstedt, L., Novotny, M., Widmark, G.

Tobacco chemistry, II: Analysis of the gas phase of tobacco smoke by gas chromatography-mass spectrometry.

J. CHROMATOGR. 45: 256-263, 1969.

ABSTRACT: The gas phase of tobacco smoke was injected, without prior condensation, through a glass injection system onto an efficient glass capillary column maintained at low temperature. Components eluted on temperature programming were studied by means of a mass spectrometer coupled to the column via a low-dead-volume molecule separator. By making use of the separation principle of the phase, thirty-four compounds were identified from their mass spectra.

39. Bartlett, O.

Pathophysiology of exposure to low concentrations of carbon monoxide.

ARCH. ENVIRON. HEALTH 16: 719-727, 1968.

ABSTRACT: This paper presents a specialized review of the literature on carbon monoxide, aimed specifically at the consequences of exposures to the low concentrations of carbon monoxide found in polluted air. When a person breathes air containing CO for several hours, he reaches a state of equilibrium with respect to the gas in which the partial pressure of CO in the blood in the pulmonary capillaries is equal to that in the alveolar and ambient air. It is interesting to note that carbon monoxide in the ambient air and CO from cigarette smoke are not additive in their biologic effect. Because carbon monoxide is adsorbed by the body only when the concentrations in the air exceed those in the blood of the pulmonary capillaries, persons with COHb (carboxyhemoglobin) in their bloodstream from smoking do not adsorb CO from the environment until it surpasses the levels present in their body.

40. Battigelli, M. C.

Sulfur dioxide and acute effects of air pollution.

J. OCCUP. MED. 10(9): 500-515, 1968.

41. Beal, S. K.

Measurements and models of indoor aerosol size spectra.

ATMOS. ENVIRON. 8: 204-205, 1974.

ABSTRACT: An in-depth study by Lum and Graedel, dealing with the problems associated with keeping particle concentrations at a minimum in computer facilities, clean rooms and the like, has been pursued further from an engineering standpoint by the author of this paper. His objective was to illustrate the influence of basic design parameters upon

system performance. This analysis, together with the work of Lum and Graedel, should aid the designer in choosing system parameters which minimize the installation and operating costs, while still meeting design requirements.

42. Beard, R. R., Westheim, G. A.

Behavioral impairment associated with small doses of carbon monoxide.

AM. J. PUBLIC HEALTH 57: 2012-2022, 1967.

ABSTRACT: In establishing improved standards of air quality, the effects of pollutants on human performance must be taken into account. This study was conducted to examine the effects of carbon monoxide exposure. In addition, the authors investigated the effects of other environmental factors, such as heat and noise, in combination with CO. A commercially built audiometer was used as a dynamic exposure chamber to test the effects of CO on young adult, nonsmoking university students. Carbon monoxide was administered in concentrations of 0, 50, 100, 175, and 250 ppm. None of the subjects experienced any discomfort during the experiment. However, a dose-related reduction of correct judgements of time intervals was clearly demonstrated. Of particular interest was the rapidity of the onset of deterioration of time discrimination under the influence of small CO concentrations. This occurred at 50 ppm after 90 minutes.

43. Becker, K. H., Schurath, U., Tatarczyk, T.

Fluorescence determination of low formaldehyde concentrations in air by dye laser excitation.

APPL. OPT. 14(2): 310-313, 02/--/75.

ABSTRACT: This paper describes a fluorescence technique for the detection of sub-ppm-concentrations of formaldehyde in air at atmospheric pressure. The aldehyde is excited by a frequency doubled tunable dye laser covering the 320-345-nm wavelength range. The fluorescence intensity, measured at right angles through 400-nm cutoff filter, is proportional to the formaldehyde concentration in air. Interferences by NO₂ and SO₂ are negligible. The detection limit of the system is 5 ppm at present, in good agreement with an estimate of the fluorescence yield in 1 atm of air. A considerable increase of the sensitivity is possible, and the use of this technique for measuring formaldehyde in ambient air in the ppb concentration range is projected.

44. Bell, R. P., Evans, P. G.

Kinetics of the dehydration of methylene glycol in aqueous solution.

PROC. R. SOC. (LONDON), SER. A 291(1426): 297-323, 04/26/66.

ABSTRACT: Methods are described for measuring the velocity of the reaction $\text{CH}_2(\text{OH})_2 \rightarrow \text{CH}_2\text{O} + \text{H}_2\text{O}$ in aqueous solution by making use of the rapid reaction of unhydrated formaldehyde with the scavenging reagents semicarbazide, hydroxylamine, phenylhydrazine, hydrazine and sulphite. The reaction exhibits general acid-base catalysis, and catalytic constants are given for 14 acids and 30 bases. Relations between acid-base strength and catalytic power extend over an unusually wide range of velocities and types of catalyst, and this behaviour is discussed in terms of reaction mechanisms. The catalytic behaviour observed shows unexpected contrasts with that reported for the hydration of carbon dioxide. It is shown that, contrary to previous reports, the rate of removal of formaldehyde from aqueous solution by a gas stream is not appreciably affected by the rate of dehydration of methylene glycol. A few experiments are reported on the application of the chemical scavenger method to measure the rate of the reaction $\text{CH}_3\text{CH}(\text{OH})_2 \rightarrow \text{CH}_3\text{CHO} + \text{H}_2\text{O}$, and the results compared with those obtained by other methods.

45. Bellar, T. A., Sigsby, J. E., Jr.

Direct gas chromatographic analysis of low molecular weight substituted organic compounds in emissions.

ENVIRON. SCI. TECHNOL. 4(2): 150-156, 02/--/70.

ABSTRACT: This paper describes an automated, gas chromatographic method for direct

analysis of C2 through C4 aldehydes, C3 and C4 ketones, and various other oxygen-, nitrogen-, and halogen-containing organic compounds present in combustion effluents. Retention times are given for a great variety of compounds this system is capable of analyzing. Examples of chromatograms from analysis of samples of auto exhaust, trench incineration effluents, and ambient air are included. The limit of detection for the system is 0.05 P.P.M. of acetaldehyde.

46. Belman, S.

The fluorimetric determination of formaldehyde.

ANAL. CHIM. ACTA 29: 120-126, 1963.

47. Berge, A., Mellegaard, B.

Formaldehyde emission from particle board: A new method for determination.

FOR. PROD. J. 29(1): 21-25, 01/--/79.

ABSTRACT: A new method is described for the quantitative determination of formaldehyde in air, particularly formaldehyde emission from particle board. A sample volume of 1 liter air is sufficient for analysis in the range 0.1 to 1 milligram/cubic meter. The air sample is collected in a gas burette and the formaldehyde is then extracted in a small amount of water. The formaldehyde concentration in the water extract is finally determined by the acetylacetone method combined with fluorescence spectroscopy. Methods for measuring formaldehyde emission from particleboard on a small and convenient scale simulating practical conditions have been developed. A preconditioned board sample is placed in a desiccator, and an approximate equilibrium value for formaldehyde emission independent of board loading is determined. Having a sample of 200 square centimeters in an air volume of 6 liters an equalization time of 2 hours is sufficient when the air is forced to circulate. For nondestructive testing of large specimens, the desiccator may be replaced with a bell letting the board sample constitute a bottom in the bell. The equilibrium emission from urea type particleboard, preconditioned at 20 degrees C and 65 percent RH, increases about four times when raising the temperature from 20 degrees to 35 degrees C. The saturation concentration of formaldehyde above extremely dilute water solutions shows approximately the same temperature dependence.

48. Berglund, B., Lindvall, T.

Olfactory evaluation of indoor air quality. 16 p.

ABSTRACT: Air quality in dwellings and assembly rooms many times can be controlled by use of the odor criterion because it has an obvious relationship to discomfort and it gives an instant indication of malfunction in the ventilation system. In ongoing research projects air pollutants outdoors and indoors are compared. The focus is on the volatile organic compounds in air as well as on the odor of the air content as a whole. A method of sampling and analysis of volatile organic compounds in air has been developed as well as psychophysical methods for studying sensory reactions. In old buildings 50-75 % of the volatile organic compounds in air are found to be associated with odors. Only less than 2 % of the odor reports were not associated with chemically detectable compounds. Several pollutants seem to increase in concentration from outdoor to the indoor air. Indoors a number of solvents like alcohols and terpenes are predominant. The use of heat exchangers that also transfer moisture may transfer polar as well as nonpolar compounds to the inlet air. The degree of circulation of polar compounds can be around 35-80 % of the outlet air concentrations. Already the inlet air to a preschool room was found to be contaminated relative to the outdoor air. Similarly, the ventilation inlet of a class room in a high school was found to be contaminated with bad odors. After 30 min of a classmeeting the class room was overloaded with odors when the class size was just 2/3 of its nominal capacity. The occupant related odor was clearly separated from the background room odor when the CO₂-concentration was above 0.08 vol %. A master scale principle has been developed for obtaining comparable measures of odor strength from different observers as well as for different objects of investigation. On the master scale of odor strength, comparisons was easily made of the odor of class room air, of the ventilation inlet air, and of kitchen air from an earlier field study.

49. Berglund, B., Lindvall, T.

Olfactory evaluation of indoor air quality.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: Air quality in dwellings and assembly rooms many times can be controlled by use of the odor criterion because it has an obvious relationship to discomfort and it gives an instant indication of malfunction in the ventilation system. In ongoing research projects air pollutants outdoors and indoors are compared. The focus is on the volatile organic compounds in the air as well as on the odor of the air content as a whole. A method of sampling and analysis of volatile organic compounds in air has been developed as well as psychophysical methods for studying sensory reactions. In old buildings, 50-75 percent of the volatile organic compounds in air are found to be associated with odors. Only less than 2 percent of the odor reports were not associated with chemically detectable compounds. Several pollutants seem to increase in concentration from outdoor to indoor air. Indoors a number of solvents like alcohols and terpenes are predominant. The use of heat exchangers that also transfer moisture may transfer polar as well as nonpolar compounds to the inlet air. The degree of circulation of polar compounds can be around 35-80 percent of the outlet air concentrations. Already the inlet air to a preschool room was found to be contaminated relative to outdoor air. Similarly, the ventilation inlet of a classroom in a high school was found to be contaminated with bad odors. After 30 minutes of a class meeting, the classroom was overloaded with odors when the class size was just 2/3 of its nominal capacity. The occupant-related odor was clearly separated from the background room odor when the CO₂ concentration was above 0.08 vol percent. A master scale principle has been developed for obtaining comparable measures of odor strength from different observers as well as for different objects of investigation. On the master scale of odor strength, comparisons were easily made of the odor of classroom air, of the ventilation inlet air, and of kitchen air from an earlier field study.

50. Bertsch, W., Zlatkis, A., Liebich, H. M., Schneider, H. J.
Concentration and analysis of organic volatiles in Skylab 4.
J. CHROMATOGR. 99: 673-687, 1974.

ABSTRACT: The volatile components in the cabin atmosphere of Skylab 4 at various times during the mission were concentrated and analysed. More than 300 compounds could be detected by high-resolution gas chromatography with differences in concentration of as much as six orders of magnitude. 107 substances were identified by mass spectrometry, covering a molecular-weight range of approximately 60 to more than 500. The concentration of 80 compounds were determined for three samples taken on days 11, 47 and 77 of the mission. The composition of the volatiles in the spacecraft's atmosphere differs significantly from other environments. A wide variety of various silicon compounds, mostly methylated siloxanes of molecular weight up to 584, was detected. Fluorocarbons (Freons) were also present.

51. Bertsch, W., Shunbo, F., Chang, R. C., Zlatkis, A.
Preparation of high resolution nickel open tubular columns.
CHROMATOGRAPHIA 7(3): 128-134, 03/--/74.

ABSTRACT: A detailed description of the production of nickel open tubular columns is given and the important steps are discussed. Two types of surface modification, etching and introduction of a suspended silanized silica, which result in conventional open tubular (COT) and in support coated open tubular (SCOT) columns are described. Properties of these columns are presented for one phase, Emulphor ON 870 and several examples of applications are given.

52. Bertsch, W., Chang, R. C., Zlatkis, A.
The determination of organic volatiles in air pollution studies: Characterization of profiles.
J. CHROMATOGR. SCI. 12: 175-182, 04/--/74.

ABSTRACT: An analytical method is described in which trace quantities of organic materials in air are adsorbed on a porous polymer of high temperature stability. The

trapped substances are subsequently heat desorbed and transferred to a short precolumn which is kept at subambient temperature. Separation is effected by gas chromatography with efficient capillary columns. Identification of the separated compounds is established by gas chromatography-mass spectrometry. Profiles established over a period of approximately 18 months are remarkably constant for samples collected in urban environments. Once a profile is qualitatively made, quantitative results can be obtained for a large number of substances with a high degree of accuracy. The absolute concentrations of substances vary within wide limits, weather conditions being the prime factor. The overall picture does not suggest large compositional variations within samples taken from heavily industrialized areas and urban environments. Several hundred substances can be recognized, ranging from C5 to C16. Almost 100 compounds, mostly alkanes and substituted aromatic hydrocarbons were identified. Other substances present in trace quantities are aldehydes and chlorinated hydrocarbons. Volatiles, eluting before benzene, can be determined only qualitatively, since displacement occurs by less volatile substances with increasing sample size. The new method has significant advantages over existing procedures such as ease of handling, versatility, simplicity and economy.

53. Bertsch, W., Anderson, E., Holzer, G.

Trace analysis of organic volatiles in water by gas chromatography-mass spectrometry with glass capillary columns.

J. CHROMATOGR. 112: 701-718, 10/29/75.

ABSTRACT: Traces of volatile organic materials in water have been concentrated by gas phase stripping and adsorption onto a porous polymer. A simple all-glass sampling device is proposed which allows efficient concentration at elevated temperatures. Sample transfer from adsorbent into a gas chromatographic column is effected by a simple one-step procedure involving heat desorption. The capacity of the adsorbent has been determined for a number of model substances which are found in water. Under the sampling conditions used, compounds being less volatile than benzene are usually quantitatively retained, with some exceptions. Separations were effected with highly efficient glass capillary columns. Water samples, collected from a small number of locations, included both tap water and untreated waters. A number of volatiles have been determined by gas chromatography-mass spectrometry in drinking water and in a river which flows through an industrialized area. The drinking water examined contains a large number of chlorinated and brominated compounds whereas the river water is largely free from this class of substances. Derivatives of camphor and terpenes have been identified in this particular river.

54. Bertsch, W., Anderson, E., Holzer, G.

Two-dimensional high resolution GLC environmental analysis: Preliminary results.

CHROMATOGRAPHIA 10(8): 449-454, 08/—/77.

ABSTRACT: The current status of gas chromatographic procedures and instrumentation for the analysis of volatile environmental contaminants is discussed. Design features of gas chromatographic systems, capable of transferring portions of eluting compounds from one gas chromatographic column into another are also discussed. A prototype two-dimensional gas chromatograph has been built and tested. The system is composed of two separate gas chromatographs, which are joined by a common heated interface. A combination of off-line valves and restrictors (Deans' switches) serves to change carrier gas flow directions. Compounds selected for cutting are transferred to the second gas chromatograph and held in an intermediate trap. The effluents from the second column are detected by FID/ECD, operated in parallel. Important parameters which effect sample transfer between the systems have been studied to serve as basis for semiautomated instrument to be built. Some applications with synthetic mixtures are demonstrated.

55. Bethge, P. O., Jonevall-Westoo, I., Sillen, L. G.

Electrometric investigation of equilibria between mercury and halogen ions, Part VI: Complexes between Hg and Br and some equilibria involving solid mercury (I) bromide.

ACTA CHEM. SCAND. 2: 828-838, 1948.

56. Betty, K. R., Karasek, F. W.

Application of automatic calculation of Kovats' retention indices to environmental analyses by gas chromatography-mass spectrometry-calculator.

J. CHROMATOGR. 166: 111-122, 1978.

ABSTRACT: Automatic calculation and plots of Kovats' retention indices (RI) from gas chromatographic (GC) analysis of environmental samples is provided by a calculator-controlled GC-mass spectrometric (MS) system. The retention indices framework of carbon numbers is set up using a standard sample containing all the desired n-hydrocarbons which are automatically identified in a GC-MS run by the presence of the m/e 85.1 C₆H₁₃ ion and the molecular ion. These standard retention data are used to automatically calculate RI values for samples extracted from airborne particulate matter run under identical GC conditions. n-Hydrocarbons present in a sample can be employed as internal standards but an editing subroutine may be necessary to remove ambiguities. Standard deviation of a test of the external standard method is 2.4 RI units, of the internal standard method 1.5 RI units.

57. Beutler, J. A., Varano, A., DerMarderosian, A.

Pyrolysis analysis of the herbicide paraquat on cannabis by coupled gas chromatography-infrared spectroscopy.

J. FORENSIC SCI. 24(4): 808-813, 10/--/79.

ABSTRACT: Pyrolysis gas chromatography coupled with infrared identification of eluted peaks confirms that paraquat is pyrolyzed into chloromethane and 4,4'-dipyridyl at smoking temperatures and above. This reaction occurs at 610 degrees C to completion in small amounts in an inert atmosphere. The toxicity of 4,4'-dipyridyl remains to be determined. Pyrolysis of contaminated marijuana also produces the same two products, although detection at low limits is difficult with this procedure.

58. Biersteker, K., de Graaf, H., Nass, C. A. G.

Indoor air pollution in Rotterdam homes.

INT. J. AIR WATER POLLUT. 9: 343-350, 1965.

ABSTRACT: Indoor and outdoor smoke and sulfur dioxide (SO₂) concentrations were analyzed from 800 paired samples of data obtained from the living room environment of 60 Rotterdam homes. Simultaneous measurements were continued for at least 7 successive days at each location to ensure inclusion of a weekend, since air pollution levels outside were known to show a weekly cycle. It was found that smoking increased the amount of smoke found in living rooms, and the data tend to suggest that newer houses tend to have less SO₂ in the living rooms than older houses. On the average, indoor levels of SO₂ and smoke measured in the living room were 20 and 80 percent of corresponding levels outdoors respectively. The probability for having more smoke indoors than outdoors was approximately 20 percent; for SO₂, the probability was less than 2 percent. The data also suggested that faulty chimneys and heaters may have a more important role in air pollution mortality during fogs than had previously been suspected.

59. Black, M. S., Rehg, W. R., Sievers, R. E., Brooks, J. J.

Gas chromatographic technique for compound class analysis of jet engine exhaust.

J. CHROMATOGR. 142: 809-822, 11/11/77.

ABSTRACT: A simple gas chromatographic (GC) technique utilizing two analytical columns and efficient olefin and oxygenate scrubbers has been developed for the determination of saturated, olefinic, and combined oxygenated-aromatic fractions of jet engine exhaust. The exhaust sample is collected on a dual-adsorbent trap containing Tenax GC and Carbosieve B at dry ice temperature and is desorbed directly into the GC system by use of a high-temperature oven. Experimental results have been obtained with synthetic exhaust hydrocarbon mixtures and actual jet combustor exhaust samples.

60. Black, M. S., Herbst, R. P., Hitchcock, D. R.

Solid adsorbent preconcentration and gas chromatographic analysis of sulfur gases.

ABSTRACT: A gas chromatographic technique for the analysis of gaseous sulfur, namely SO₂ and H₂S, is described. Ambient air containing the gaseous sulfur compounds is collected on a solid adsorbent trap of Molecular Sieve 5A and is thermally desorbed directly onto an analytical column for separation and flame photometric detection. Breakthrough studies and desorption efficiencies of SO₂ and H₂S on various adsorbents are also presented. Experimental results are given for actual air samples collected in a coastal environment where ppb levels of SO₂ and H₂S occurred.

61. Blume, K. A.

Air pollution in the schools and its effects on our children. 66 p., 1976.

ABSTRACT: A study was conducted of the Wauconda, Illinois public schools to determine the major causes of air pollution inside these buildings. There were three major objectives of this study: 1) to identify products, materials and conditions in schools which cause or contribute to indoor chemical air contamination, 2) to recommend methods to improve the quality of air in schools, and 3) to acquaint the reader with the effects of indoor air pollution on the health and scholastic ability of school building occupants. The major sources of air contamination in and around schools were found to be aerosol sprays, janitorial supplies, scholastic supplies, building materials and furnishings, HVAC and cooking equipment, cosmetics, smoking, and the school buses. Some of the known effects of toxic fumes on school children are: nervousness, irritability, antisocial behavior, reduced reading comprehension and speed, mental confusion, reduction of memory, depression, headaches, and inability to learn.

62. Bowman, M. C., Beroza, M., Acree, F., Jr.

Microdetermination of acetals of acetaldehyde, vinyl ethers, and other compounds containing combined acetaldehyde groups.

ANAL. CHEM. 33(8): 1053-1055, 07/--/61.

63. Braithwaite, M., Leone, S. R.

Laser-initiated chemical reactions: $\text{Cl} + \text{H}_2\text{S} \rightarrow \text{HCl} + \text{HS}$: Rate constant, product energy distribution, and direct detection of a chain mechanism.

J. CHEM. PHYS. 69(2): 839-845, 07/15/78.

ABSTRACT: Laser-initiated, time-resolved infrared chemiluminescence techniques are used to study the detailed kinetics of chlorine/hydrogen sulfide systems. Measurements on the $\text{Cl} + \text{H}_2\text{S} \rightarrow \text{HCl} + \text{HS}$ reaction are carried out by pulsed laser photolysis of $\text{S}_2\text{Cl}_2 \rightarrow \text{S}_2\text{Cl} + \text{Cl}$ in a flowing mixture with H₂S, while detecting vibrational chemiluminescence from the HCl product. The measured rate constant for the $\text{Cl} + \text{H}_2\text{S}$ reaction is $6.0 \pm 1.2 \times 10^{11}$ cubic centimeters/molecule/second at 296 degrees K. The vibrational product distribution is predominately excitation of HCl to $v = 1$ and $v = 2$, with the ratio ($v = 1$):($v = 2$) = 15. The dynamical interpretation of the $\text{Cl} + \text{H}_2\text{S}$ reaction data is discussed. Photolysis of $\text{Cl}_2 \rightarrow 2\text{Cl}$ in the presence of H₂S produces a rapid chain reaction, $\text{Cl} + \text{H}_2\text{S} \rightarrow \text{HCl} + \text{HS}$, $\text{HS} + \text{Cl}_2 \rightarrow \text{HSCl} + \text{Cl}$. The chain mechanism and its real time development are observed directly from the product chemiluminescence signal.

64. Brice, R. M., Roesler, J. F.

The exposure to carbon monoxide of occupants of vehicles moving in heavy traffic.

J. AIR POLLUT. CONTROL ASSOC. 16(11): 597-600, 1966.

ABSTRACT: Carbon monoxide and hydrocarbons were sampled at operators' nose height inside vehicles moving in moderate to heavy traffic in six cities. The samples were integrated over 20-30 minutes by collection in Mylar bags. Carbon monoxide and hydrocarbons were analyzed by infrared and flame ionization, respectively, with instruments at the Continuous Air Monitoring Program (CAMP) station in each city. Detector tubes for carbon monoxide were also used to determine 5-minute concentrations at suspected high points in the field. Estimates of traffic density were made. Three types of traffic

arteries were considered: 1) heavily traveled, wide expressways, 2) main city streets with moderately rapid vehicular traffic, and 3) center city streets with slow moving traffic. Integrated half-hour CO concentrations obtained within the vehicles while in traffic were generally considerably higher than the concurrent concentrations measured at the CAMP sites. In-traffic CO values in all cities sampled exceeded 30 ppm in at least 10 percent of the integrated samples. The range of city averages was 21-39 ppm carbon monoxide and the range of individual integrated samples was 7-77 ppm of carbon monoxide.

65. Bricker, C. E., Johnson, H. R.

Spectrophotometric method for determining CH₂O.

IND. ENG. CHEM., ANAL. ED. 17: 400-402, 1945.

66. Bridboard, K.

Hazards of burning candles with lead wire core wicks. 5 p., 1973.

ABSTRACT: Candles containing wicks with lead wire cores have been petitioned by Ralph Nader to the Consumer Product Safety Commission, with hopes of banning such products as a hazardous substance. Because candles are almost always burned in indoor environments, the problems of environmental lead has become a major concern of EPA. Wire core wicks studied by Dr. Sidney Wolfe, Director of the Health Research Group, were found to contain the following quantities of lead: 216,000 micrograms, 206,000 micrograms, 86,000 micrograms, 64,000 micrograms, and 172,000 micrograms. To confirm these data, the author conducted his own measurements with candles purchased in North Carolina. So as to determine the effect of burning candles with lead wire core as wicks in a closed environment, expected air levels of lead following the burning of such candles were estimated. Extrapolating the air lead levels of 850 micrograms/cubic meter during a 4-hour period in a closed chamber to a 13 hour home experiment, air lead levels could be expected to average 20 micrograms/cubic meter.

67. Bridboard, K., Finklea, J. F., Wagoner, J. K., Moran, J. B., Caplan, P.

Human exposure to polynuclear aromatic hydrocarbons., 1975.

ABSTRACT: This paper describes an activity profile model approach for assessing exposure to polynuclear aromatic hydrocarbons. Any assessment of human exposure must consider individual activity patterns which result in exposure either on the job, traveling in motor vehicles, walking through streets, in buildings, etc. An additional source of exposure is cigarette smoking and sidestream cigarette smoke. In this study, benzo-a-pyrene (BaP), as measured in particulate matter, is used as an index compound for exposure to polynuclear organics and exposures are expressed in cigarette equivalents, i.e., the number of cigarettes smoked which would result in similar BaP intake.

68. Bridge, D. P., Corn, M.

Contribution to the assessment of exposure of nonsmokers to air pollution from cigarette and cigar smoke in occupied spaces.

ENVIRON. RES. 5: 192-209, 1972.

ABSTRACT: Because it was suspected that a significant portion of the total pollutants inhaled by an urban dweller may be contributed by pollution in occupied spaces where smokers are present, a study was performed to determine pollutant concentrations in occupied ventilated spaces. Carbon monoxide was continuously monitored with a Beckman infrared analyzer and was used as a tracer for suspended particulate matter generated from cigarette and cigar smoke. Experiments were first performed in an exposure chamber with a smoking machine of new design. Pollutants were then monitored in occupied spaces with known occupancy levels and occupancy smoking rates. Measured pollutant concentrations and associated doses were compared to Threshold Limit Values for occupational exposures and Federal Ambient Air Quality Standards for outdoor air. An equation proposed by Turk for predicting pollutant concentrations from tobacco smoke generated in ventilated spaces was found to be a reliable predictor of carbon monoxide concentrations in the exposure chamber. The equation was also successfully used to predict carbon monoxide concentrations when the smoking rate and occupancy levels, as well as the room ventilation rate and mixing factor, were known. Approximately 4.6 times as much carbon monoxide was generated in cigarette

sidestream smoke as in the mainstream smoke. One cigar generated approximately 1.7 to 2.5 times as much carbon monoxide as three cigarettes. When measured and predicted pollutant concentrations from smoking in occupied spaces were compared to Federal Ambient Air Quality Standards, the results suggested that carbon monoxide from cigarette and cigar smoking did not present an inhalation hazard to nonsmokers, but suspended particulate matter may reach excessive concentrations.

69. Brookman, G. T., Kalika, P. W.

Measuring the environmental impact of domestic gas-fired heating systems. 86-104, 1974.

ABSTRACT: This program assessed the impact of gas-fired home heating systems on two predominantly gas-fired residential areas using both measurement and diffusion modeling techniques. One area consisted of relatively new homes (under 5 years); the other was composed of 14-year old homes and heating systems. Furnace emissions were measured at 50 homes during the heating season. Aldehydes were one of the pollutant types monitored using the Sodium Bisulfite Method. The average observed levels of aldehydes (HCHO) fell between 11.5-16.3 pounds/E6 cubic feet gas over the two sampling periods. This exceeds the published emissions factor of 10.0 pounds/E6 cubic feet cited by the U.S. Environmental Protection Agency ("Compilation of Air Pollutant Emission Factors," February 1972).

70. Bruner, F., Ciccioli, P., Di Nardo, F.

Use of graphitized carbon black in environmental analysis.

J. CHROMATOGR. 99: 661-672, 11/06/74.

ABSTRACT: The versatility of graphitized carbon black as a column material for various environmental analytical problems is shown by studies on the gas chromatography of sulphur compounds and olefins in air. Its feasibility for use in the analysis of unknown complex mixtures with widely different volatiles is reported. It is also shown that good results are obtained using graphitized carbon black as an adsorbent to trap and release air pollutants, ensuring the absence of impurities that arise from the sampling technique.

71. Bruner, F., Bertoni, G., Severini, C.

Gas chromatographic determination of bis(chloromethyl) ether emissions in the atmosphere of industrial plants.

ANAL. CHEM. 50(1): 53-55, 01/--/78.

ABSTRACT: An analytical method for the determination of bis(chloromethyl) ether in air based on gas chromatography only is described. Selective packed columns are employed for the analysis. An indirect analytical procedure for the determination of this compound at the ppt level from the composition of liquid reactant mixtures is also reported.

72. Buchanan, D., Buchner, A.

Air pollution by aluminum compounds resulting from corrosion of air conditioners.

ENVIRON. SCI. TECHNOL. 8: 752-755, 1974.

ABSTRACT: Hydrated aluminum oxide (Al₂O₃ H₂O and Al₂O₃ 3H₂O), chlorinated aluminum oxide (Al₂O₃ HCl), and carbonated aluminum oxide (Al₂O₃ CO₂) contribute to air pollution as products of the corrosion of air conditioners. In cold rooms at temperatures 3-6 degrees C, this pollutant precipitates from the air coating all surfaces in the rooms with a film of gray dust. In air-conditioned rooms at normal temperatures of 20-25 degrees C, this aluminum-based film was not evident; however, the air contained approximately 10 times as much of this pollutant as that in the cold rooms. This concentration of dust corresponds to an unacceptably high concentration by the Air Quality Standards of the Government of Ontario. During the summer (when the air conditioner was at peak operation) the air contained more of this pollutant than during the winter (when the air conditioner was not operational). Daytime and nighttime concentrations of dust in air-conditioned rooms during the summer also differed appreciably.

73. Budde, W. L., Eichelberger, J. W.

Organics in the environment.

ANAL. CHEM. 51(6): 567A-574A, 05/--/79.

74. Burch, G. E.

Editorial-toxic agents, cardiovascular disease, and the polluted home.

AM. HEART J. 87(6): 679-680, 1974.

ABSTRACT: The author of this article discusses his dismay with the overwhelming quantity of toxic chemical pollutants that exist in American homes. He urges an increased awareness in studies with residential indoor environments that subject the human body to a "constant unrelenting chemical trauma."

75. Cain, W. S.

Interactions among odors, environmental factors and ventilation.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: The American Society of Heating, Refrigerating, and Air-Conditioning Engineers has recommended a 30 percent reduction in ventilation rate for new buildings. The reduction will cause roughly a 43 percent increment in concentration of indoor contaminants and a 20 percent increment in perceived odor. Although temperature and humidity seem to reduce olfactory sensitivity, only humidity can exert a strong suppressive influence under conditions achievable indoors. From olfactory considerations alone, humidification of dry ventilation air could theoretically neutralize the increase in odor caused by a 30 percent reduction in ventilation. Nevertheless, this maneuver would probably waste rather than save energy. Reduced ventilation may lead to increased use of odor modifiers. These take advantage of inherent properties of olfaction, and can lead to attenuation of both total odor magnitude and the apparent presence of malodors. Such agents have some legitimate uses but, like air treatment systems that partially oxidize contaminants, lead at best to perceptually rather than objectively clean air.

76. Cares, J. Walkley

Determination of formaldehyde by the chromotropic acid method in the presence of oxides of nitrogen.

AM. IND. HYG. ASSOC. J. 405-410, 07/--/68.

77. Carey, M. A., Persinger, H. E.

Liquid chromatographic determination of traces of aliphatic carboxyl compounds and glycols as derivatives that contain the dinitrophenyl group.

J. CHROMATOGR. SCI. 10(9): 537-543, 1972.

78. Cautreels, W., Van Cauwenbergh, K.

Experiments on the distribution of organic pollutants between airborne particulate matter and the corresponding gas phase.

ATMOS. ENVIRON. 12: 1133-1141, 1978.

ABSTRACT: Airborne particulate matter sampling was used in conjunction with gas phase sampling. Particulates were collected on glass fiber filters. Organic compounds not retained by the filter material were trapped from the gas phase on Tenax-GC polymer beads. Qualitative and quantitative analysis of the sample extracts was performed by gas

chromatography mass spectrometry with computerized data elaboration. More than 100 compounds were identified in the gas phase. About 50 of these compounds were quantified in both aerosol and gas samples with a precision of better than 10%. A distribution factor was defined for individual compounds as the ratio of the concentration of the compound in the particulate fraction over the concentration in the gas phase. Lower molecular weight compounds with high vapor pressure were present predominantly in the gas phase. High boiling compounds were preferentially retained on the filter material.

79. Chamberlain, A. C.

Symposium of Plume Behavior.

INT. J. AIR WATER POLLUT. 10: 403-409, 1966.

ABSTRACT: This article contains various papers based on contributions of original work presented at the Symposium of Plume Behavior at Rijksinstituut voor de Volkgezondheid, Brandenburgerweg, Bilthoven, Holland, in 1965. This study made some comparisons of pollutants inside and outside a building in central London in early 1960. Smoke concentrations were found to be much the same indoors and outdoors, especially at low ambient concentrations (<100 micrograms/cubic meter). Indoor sulfur dioxide (SO₂) was always lower than outdoor, and generally 40 percent lower.

80. Chrastil, J., Wilson, J. T.

A sensitive colorimetric method for formaldehyde.

ANAL. BIOCHEM. 63(1): 202-207, 1975.

81. Ciccioli, P., Bertoni, G., Brancaleoni, E., Fratarcangeli, R., Bruner, F.

Evaluation of organic pollutants in the open air and atmospheres in industrial sites using graphitized carbon black traps and gas chromatographic-mass spectrometric analysis with specific detectors.

J. CHROMATOGR. 126: 757-770, 11/03/76.

ABSTRACT: A method for evaluating the organic content of the atmosphere, involving the use of personal samplers, is described. A comparison of the performances of Tenax GC and Carboxack B is given in terms of sample recovery. Apparatus including selective columns, specific detectors and combined gas chromatography-mass spectrometry is also described. Practical examples of the analysis of organic air pollutants trapped in the open air and the atmosphere in a chemical plant are discussed. A comparison of the results of complete gas chromatography and of the total hydrocarbon content is also made.

82. Clemons, C. A., Coleman, A. L., Saltzman, B. E.

Concentration and ultrasensitive chromatographic determination of sulphur hexafluoride for application to meteorological tracers.

ENVIRON. SCI. TECHNOL. 2(7): 551-556, 1968.

ABSTRACT: Sulfur hexafluoride (SF₆) analytical techniques offer a fast and reliable way to study the transport of pollutants by monitoring the dispersion of an inert gaseous tracer. This article describes the use of activated charcoal to adsorb and concentrate traces of SF₆ in the air with subsequent release of the sample for gas chromatographic analysis. This procedure establishes a new level of analytical sensitivity of 1 part of SF₆ in E14 parts of air and opens a broad area of application to ultrasensitive analysis previously unattained. Sample collection and preparation of calibration mixtures in Saran bags is discussed. Efficiency drops as sample size is increased. The determination of the distribution of concentrations of SF₆ taken downwind from a release point demonstrates meteorological application for a range of 75 miles.

83. Cleveland, W. S., Graedel, T. E., Kleiner, B.

Urban formaldehyde: Observed correlation with source emissions and photochemistry.

ABSTRACT: Statistical analyses of formaldehyde data from four sites in New Jersey show the effects on formaldehyde concentrations during the hours 05:00 to 20:00 decrease from workdays to Saturdays to Sundays corresponding to a reduction in motor vehicle traffic. On workdays the formaldehyde concentrations are higher on days with more photochemical activity. As with ozone, formaldehyde shows a yearly variation in which concentrations are considerably higher in summer than in winter. The peak formaldehyde concentrations (as measured by the upper decile of 1-h daily maxima) at the four sites are in the range 14-20 ppb.

84. Cliff, K. D.

Population exposure to the short-lived daughters of radon-222 in Great Britain.

RADIOL. PROT. BULL.(22), 1978.

ABSTRACT: A survey of the concentrations of radon decay product activity in rooms of domestic dwellings in Great Britain was performed. The objective was to estimate population exposure, so measurements were made in areas of high population density. Periodic measurements were made of the RaA concentration in the room air and in the outside air and of the ventilation rate of the room. It was found that the actual concentration of each daughter in the room air depends strongly on the room ventilation rate. For the purpose of estimating population exposure, a mean ventilation rate of one room air change per hour was used. From the information gathered and analyzed in this study, mean population exposure was determined to be 10 percent of the cumulative exposure known to increase the risk of lung cancer in uranium miners.

85. Cohen, I. R., Altshuler, A. P.

A new spectrophotometric method for the determination of acrolein in combustion gases and in the atmosphere.

ANAL. CHEM. 33(6): 726-733, 05/--/61.

86. Cohen, I. R., Altshuler, A. P.

3-methyl-2-benzothiazolone hydrazone method for aldehydes in air: Collection efficiencies and molar absorptivities.

ANAL. CHEM. 38: 1418, 1966.

87. Colket, M. B., Naegeli, D. W., Dryer, F. L., Glassman, I.

Flame ionization detection of carbon oxides and hydrocarbon oxygenates.

ENVIRON. SCI. TECHNOL. 8(1): 43-46, 1974.

88. Corn, M.

Characteristics of tobacco sidestream smoke and factors influencing its concentration and distribution in occupied spaces.

SCAND. J. RESPIR. DIS. 91: 20-36, 1974.

ABSTRACT: This document focuses on the important factors related to cigarette sidestream smoke after emission in the air of occupied spaces. An attempt has been made to extract those data which reveal components of tobacco smoke which have been considered by investigators in studying the exposure of individuals in passive smoking. Another objective of this paper is to isolate those variables associated with the design of occupied spaces, including selected characteristics of ventilation systems, in order to see their effect on the concentrations of tobacco smoke compounds in occupied spaces. Although a large number of variables in the cigarette content contribute to uncertainties in establishing emission rates, there are some data which permit estimates to be made for

emission of particulates, nicotine, benzo-a-pyrene, phenols, carbon monoxide, carbon dioxide, nitrous oxides, ammonia, and water.

89. Cote, W. A., Wade, W. A., Yocom, J. E.

A study of indoor air quality. EPA-650/4-74-042 282 p., 1974.

ABSTRACT: This report describes the results of a three-phase study to investigate the indoor generation of air pollutants. Field and laboratory measurements of nitrogen dioxide (NO₂), nitric oxide (NO), and carbon monoxide (CO) were made to evaluate the contribution of gas stoves to indoor pollutant levels. Additionally, an inventory of significant sources of indoor air contaminants was made. The results of this program show the concentrations of NO₂, NO and CO to which the occupants of the residences are exposed, the variation of pollutant concentrations within a structure, the relative magnitude of indoor-generated pollutants and outdoor pollutants which penetrate a structure, the influence of stove operations upon the generation of pollutant quantities, and the relative importance of contaminants other than gas appliances.

90. Cotton, F. A., Wilkinson, G.

Advanced inorganic chemistry: A comprehensive text. 2nd ed. 1136 p.

91. Cox, R. A., Penkett, S. A.

Effect of relative humidity on the disappearance of ozone and sulphur dioxide in contained systems.

ATMOS. ENVIRON. 6: 365-368, 1972.

ABSTRACT: The decay of sulfur dioxide and ozone concentrations has been observed in two different containers. The decay is first order in both cases, indicating irreversible absorption on the walls. Relative values are considered in terms of deposition velocities v_d and these are shown to be very sensitive to the humidity of this system. In the case of sulphur dioxide at high humidities, (v_d) values are high and come very close to the maximum value for the system as measured by Thorium B disappearance. In the case of ozone, v_d is much smaller but the increase with humidity is sufficiently large to affect overall ozone concentrations in experiments simulating photochemical smog formation.

92. Cudney, R. A., Walther, E. G., Malm, W. C.

A fast gas chromatographic method for measuring C₂-C₆ alkanes and alkenes in air.

J. AIR POLLUT. CONTROL ASSOC. 27(5): 468-470, 05/1977.

ABSTRACT: There are many methods for determining hydrocarbon concentrations in ambient air. Most of them, however, are either extremely sophisticated and give more information than may be desired, or are not responsive to extremely low concentrations, requiring a freeze-on procedure for analysis of relatively clean samples. We have devised a technique for separating and quantifying C₂ to C₆ alkanes and alkenes in concentrations down to 1 ppb.

93. Dagani, D., Archer, M. C.

Colorimetric determination of acetaldehyde in the presence of formaldehyde.

ANAL. BIOCHEM. 87(2): 455-459, 1978.

94. Davies, J. E., Edmundson, W. F., Raffonelli, A.

The role of house dust in human DDT pollution.

AM. J. PUBLIC HEALTH 65(1): 53-57, 1975.

ABSTRACT: A study of pesticide residues in house dust indicates that contamination of house dust by domestic use of insecticides containing DDT and other pesticides is primarily responsible for human serum residues. House dust is contaminated by domestic application of pesticides. This study reviews the findings of a health and ecology survey conducted on a small island in the Caribbean, and assesses the role of the domestic use of DDT in human pesticide pollution in this tropical setting. DDT residues were significantly higher in females, a finding which supported a domestic exposure. The average interior DDT concentrations from 15 sampling sites was 129.1 ppm in comparison to 8.4 ppm found outside the home.

95. Davis, J. H., Davies, J. E., Raffonelli, A., Reich, G.

The investigation of fatal acrylonitrile intoxications.

PESTICIDES AND THE ENVIRONMENT: A CONTINUING CONTROVERSY. 547-555, 1973.

ABSTRACT: In Florida, acrylonitrile (vinyl cyanide) has achieved widespread use as a structural pest fumigant. However, its vapor explosion hazard requires that it be mixed with a nonflammable volatile adjunct. In home fumigation, the solution is placed in open containers and circulated through the tented structure with the aid of fans for a period of 24-72 hours. This study looks at reported illnesses and deaths associated with fumigation of this type.

96. Derham, R. L., Peterson, G., Sabersky, R. H., Shair, F. H.

On the relation between indoor and outdoor concentrations of nitrogen oxides.

J. AIR POLLUT. CONTROL ASSOC. 24(2): 158-161, 1974.

ABSTRACT: Simultaneous measurements were made of the concentrations of NO, NO₂, and CO inside and outside of a building. The building is located in the Los Angeles area which is heavily polluted by photochemical smog, and the experiments were conducted at a time of the year when the pollutants in question tend to be high. The results show that there is a direct relationship between the inside and outside concentrations, and that the phase lag between the concentrations depends principally on the ratio of the building volume to the ventilation rate. Although the outside concentrations of the pollutants in question did not follow the same pattern every day, peak concentrations seemed to be related to "rush-hour" traffic. By reducing ventilation rates during these periods, it may be possible to reduce the concentration peaks inside the building. The building involved in the current study was not located in the immediate vicinity of heavy traffic, and the indoor concentrations of NO, NO₂, and CO did not appear to be very severe when compared to those defined by present air quality standards. Finally, the results support the belief that NO and O₃ do not coexist indoors except in very small quantities.

97. Dickinson, R. G., Jacobsen, N. W.

A new sensitive and specific test for the detection of aldehydes: Formation of 6-mercapto-3-substituted-s-triazolo[4,3-b]-s-tetrazines.

CHEM. COMMUN. (24) 1719-1720, 12/23/70.

ABSTRACT: The ready reaction of 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole with aldehydes to form coloured derivatives of s-triazolo[4,3-b]-s-tetrazine is described.

98. Dimitriades, B., Ellis, C. F., Seizinger, D. E.

Gas chromatographic analysis of vehicular exhaust emissions.

ADV. CHROMATOGR. 8: 327-362, 1969.

99. Douglas, R. L., Hans, J. M., Jr.

Gamma radiation surveys at inactive uranium mill sites. Technical Note No. ORP/LV-75-5 87 p., 1975.

ABSTRACT: This report presents the results of gamma radiation surveys conducted by the Office of Radiation Programs of the U.S. Environmental Protection Agency at 20 inactive mill sites in the western United States. The purpose of these surveys was to measure the extent to which radioactive material had been spread into the environment from the sites by the action of wind and/or water erosion, and by milling activities. The results indicate that hundreds of acres of land exclusive of the tailings piles have been contaminated to above background levels. Some of the contaminated land is private, off-site property. Survey techniques were developed to locate the spread of radioactive materials and to estimate the gamma exposure rates resulting from them. These measurements were complicated by the presence of direct gamma radiation from the tailings piles. Iso-exposure rate lines were located around each site and plotted on site maps to facilitate site decontamination decisions. These lines, corresponding to post-cleanup exposure rates of background, 10, 40, and 40 microrads/hour, were selected to correspond to current ORP criteria for decontamination of inactive uranium mill sites.

100. Dravnieks, A.

Organic contaminants in indoor air and their relation to outdoor contaminants: Final report on phase I (Development of methodology and initial field trials). ASHRAE RP 183 report number=IITRI Project No. C8276 17 p.

ABSTRACT: A method was developed for collecting samples of organic contaminants from air and their transfer to a gas-chromatographic/mass-spectrometric system. The method eliminated the previously needed cryogenic enrichment step, and yielded very reproducible data on two-liter air samples collected within 30-60 minutes without use of air-contaminating electrical devices. Mass-spectrometric identifications of contaminants encountered at 1 ppb vol/vol concentration levels were possible if the contaminants were sufficiently resolved in the gas-chromatograph.

101. Dravnieks, A.

Measurements of odors in an indoor environment.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: The identity and concentrations of odorants can be characterized by analytical measurements on samples extracted from air by polymeric adsorbents. Such data permit an evaluation of the odor control effect on specific odorants, but cannot be readily interpreted in terms of odor sensation. The utility of odor thresholds in the evaluation of indoor odors is limited to near-threshold concentrations, to estimate what percentage of individuals might be affected if, for example, ventilation is reduced. Measurements of suprathreshold intensities are possible using the ASTM E-544 scale based on 1-butanol. Measurements at several dilutions produce a dose/response function which may serve for estimating the effect of ventilation change on odor intensity. Cigarette smoke odor was used to explore this methodology: odor intensity changed proportionally to 0.26 power of the smoke concentration. The feasibility of physical separation of sampling and evaluation sites was indicated by testing smoke samples taken in a FEP Teflon bag. Annoyance by an odor depends on the type and intensity of the odor. It is suggested that low "iso-annoyance" intensities may be specified, different for different odors, and that the dose/response functions may be used as an engineering tool in designing for indoor air quality.

102. Driscoll, J. N.

Evaluation of a new photoionization detector for organic compounds.

J. CHROMATOGR. 134(1): 49-55, 1977.

103. Drivas, P. J., Simmonds, P. G., Shair, F. H.

Experimentation characterization of ventilation systems in buildings.

ENVIRON. SCI. TECHNOL. 6(7): 609-614, 1972.

ABSTRACT: Tracer experiments, involving sulfur hexafluoride, were used to obtain

quantitative data regarding actual residence time distribution in rooms and hallways, and contamination caused by reentry of laboratory fume hood exhausts into a building. Application of a mixing factor was found to be of use, and measured values ranged from 0.3 to 0.7 in small rooms without fans. One experiment involved a roof exhaust with ventilation intakes both on an adjoining roof and at ground level; in this experiment more of the exhaust reentered the ground level intake of the same building as compared to the roof intake of an adjoining building. In another experiment, 20 percent of the fumes exhausted were found to reenter the ventilation system.

104. Drivas, P. J., Shair, F. H.

Probing the airflow within the wake downwind of a building by means of a tracer technique.

ATMOS. ENVIRON. 8: 1165-1175, 1975.

ABSTRACT: Ventilation and infiltration affect the transport of outdoor pollutants into a building; ventilation and infiltration are in turn influenced by the air flow patterns around buildings. This study uses sulfur hexafluoride as a tracer to probe the airflow and dispersion patterns of a three-story building so as to gain knowledge of airflow dynamics. Specifically, the extent and velocities of the recirculation in the wake were investigated and a characteristic exponential dilution time for the wake was determined. Also, direct infiltration of the tracer into the building was examined.

105. Drozd, J.

Chemical derivatization in gas chromatography.

J. CHROMATOGR. 113: 303-356, 1975.

106. Drozd, J., Novak, J., Rijks, J. A.

Quantitative and qualitative head-space gas analysis of parts per billion amounts of hydrocarbons in water: A study of model systems by capillary-column gas chromatography with splitless sample injection.

J. CHROMATOGR. 158: 471-482, 1978.

ABSTRACT: The reliability of qualitative and quantitative head-space gas analysis of parts per billion amounts of hydrocarbon in aqueous samples was studied on model systems by capillary-column gas chromatography. A simple all-glass splitless injection system is described that allows the introduction of head-space gas samples with a negligible decrease in efficiency. The applicability of different types of squalane capillary columns for head-space gas analysis was evaluated. The suitability of the standard addition method for quantitative head-space gas analysis is discussed for concentrations in the condensed phase varying from units to hundreds of parts per billion.

107. Easty, D. B., Blaedel, W. J., Anderson, L.

Continuous electrochemical determination of cyanide: Application to cyanogenic glycosides in Sudan grass.

ANAL. CHEM. 43(4): 509-514, 04/—/71.

ABSTRACT: A continuous system has been developed for the determination of cyanide liberated from plant tissues. Plant homogenates are continuously acidified and the HCN is volatilized in two stages by high velocity streams of nitrogen. Following absorption by a stream of dilute base, the cyanide is measured amperometrically with a tubular gold electrode. Current measured is linear for cyanide concentrations between E-6 and E-4 or 0.2 micro M (absolute), whichever is greater. For 0.5-gram grass samples, these standard deviations correspond in HCN content to 2% (relative) or 2 ppm (absolute), whichever is greater. In application of the method to Sudan grass cyanogenic glycosides first must be hydrolyzed to release cyanide. This is accomplished by homogenization of the grass followed by a 1-hour incubation at room temperature with the enzyme, emulsin.

108. Eimutis, E. C., Quill, R. P.

ABSTRACT: The report lists stationary sources that emit each of 320 noncriteria pollutants. It also indicates quantities of such emissions. The list was prepared, using a computerized data base established for emissions of air pollutants from approximately 600 stationary source types in the combustion, organic materials, inorganic materials, and open source categories. (A source type is defined as a group of emission sources which have the same process and emission characteristics).

109. Elkins, R. H., Ng, D. Y. C., Zimmer, J., Macriss, R. A.

A study of CO and NO_x levels in the indoor environment., 1974.

ABSTRACT: This paper presents the results of a comprehensive indoor air quality survey of 157 homes in the Chicago metropolitan area and 119 homes in the Columbus, Ohio metropolitan area. The results of this survey indicate that many factors control the levels of carbon monoxide and the oxides of nitrogen in the residential environment. In the kitchen, nitrogen dioxide levels are influenced by both electric and gas cooking appliances; absolute levels are dependent on levels of cooking, natural infiltration, forced exfiltration and background concentration. In addition, the problems associated with the analytical method available for measuring ambient air levels of nitrogen dioxide in the field are discussed.

110. Elliott, L. P.

Air quality during public gatherings.

J. AIR POLLUT. CONTROL ASSOC. 25: 635-636, 1975.

ABSTRACT: The objective of this study was to evaluate air quality during public gatherings in arenas and to compare observed levels with existing Federal and state air quality standards. Suspended particulate matter, carbon monoxide, and benzo-a-pyrene were measured at 3 arenas during 19 public gatherings over a 2-year period. Using a fluorimetric method to determine BaP concentrations, observed levels ranged from 7.1 nanograms/cubic meter with an audience of 8,674-10,786 to 21.7 nanograms/cubic meter with an audience of 13,100-14,277. Using cigarettes as a unit for exposure, a person attending the arena at times of large capacity would receive as much exposure to BaP as he would by smoking 8 cigarettes.

111. Elliott, M. A., Nebel, G. J., Rounds, F. G.

The composition of exhaust gases from diesel, gasoline, and propane-powered motor coaches.

J. AIR POLLUT. CONTROL ASSOC. 5: 103-108, 1955.

112. Ellis, C. F.

Chemical analyses of automobile exhaust gases for oxygenation. Report of Investigations 5822 35 p., 1961.

113. Ellis, C. F., Kendall, R. F., Eccleston, B. H.

Identification of some oxygenates in automobile exhausts by combined gas-liquid chromatography and infrared techniques.

ANAL. CHEM. 37(4): 511-516, 1965.

114. Ellis, W. D., Tometz, P. V.

Room-temperature catalytic decomposition of ozone.

ATMOS. ENVIRON. 6: 702-714, 1972.

ABSTRACT: When undesirable amounts of ozone are present in confined spaces, it is possible to remove the ozone by catalytic decomposition. The purpose of this study was to obtain quantitative data on the room temperature catalytic decomposition of ozone. Ozone decomposition efficiency of 35 materials, including charcoal, metals, and metal oxides, was tested, identifying charcoal and nickelous oxide as the overall best catalysts. A 1/2-inch thick filter bed of these materials initially removed 95 and 80 percent, respectively, of the ozone from a 1 cubic foot/min airstream containing 250 ppb of ozone. Catalytic efficiency of all materials was found to diminish with time. The effects of some operating parameters on catalytic efficiency were investigated and qualitatively explained on the basis of a simple adsorption model.

115. Epler, J. L., Guerin, M. R.

Mutagenic components of alternate energy sources. Paper No. 78-23.5, 1978.

ABSTRACT: This paper examines the feasibility of using short-term mutagenicity assays to predict the potential biohazard of various crude and complex test materials in a coupled chemical and biological approach. The test materials studied included environmental effluents and crude products from the synthetic fuels industries. Preliminary screening with the sensitive Ames histidine-reversion strains allowed the researchers to study the application of mutagenicity testing to these materials. These mutagenicity tests are intended to act as predictors of profound long-range health effects such as mutagenesis and for carcinogenesis. Although this work emphasized materials from the synthetic fuel technologies, this test can be applied as a prescreen for potential genetic hazards of tobacco smoke condensates, hair dyes, fly ash and other materials commonly found in indoor environments.

116. Erickson, M. D., Michael, L. C., Zweidinger, R. A., Pellizzari, E. D.

Development of methods for sampling and analysis of polychlorinated naphthalenes in ambient air.

ENVIRON. SCI. TECHNOL. 12(8): 927-931, 08/—/78.

ABSTRACT: A procedure and sampler to collect and analyze for polychlorinated naphthalenes (PCN's) in ambient air were developed. PCN's were collected on a glass fiber filter (GFF) and two precleaned polyurethane foam (PUF) plugs in tandem. PCN's were triply extracted from PUF and GFF with toluene at 25 degrees C. Samples were analyzed by quadrupole gas chromatography/mass spectrometry/computer (GC/MS/COMP) in the multiple ion detection (MID) mode, permitting detection of <50 pg of one PCN isomer (about 0.3 ng/m³ of air). The presence of PCN's was confirmed either by the mass spectra or by monitoring the chlorine isotope ratio. PCN's were detected in air near a manufacturing site at an average concentration of 150 and 1400 ng/m³ during two successive 24-h sampling periods. Although all isomers were observed, mono-, di-, and trichloronaphthalene accounted for 27, 31, and 37% of the total, respectively. The PCN's were found predominantly (93%) on the first PUF plug, with the remainder on the GFF and second PUF plug. PCN levels between 9.8 and 33 ng/m³ were also detected at a user site.

117. Esmen, N. A.

Characterization of contaminant concentrations in enclosed spaces.

AM. CHEM. SOC. 12(3): 337-339, 1978.

ABSTRACT: In this paper, generalized equations for contaminant concentration buildup and decay are developed for an enclosed, ventilated space. The generalized equations take local mixing factors and source characteristics into account, and the illustrative cases show that the usual method of estimation can be totally erroneous. Using the principles of the mass balance equation, the decrease of a pollutant following a single release will be an exponential decay assuming the air in the room is well mixed.

118. Ettore, L. S.

The Kovats retention index system.

ANAL. CHEM. 36(8): 31A-41A, 07/—/64.

ABSTRACT: In gas chromatography, the proper expression of the retention data is one of the most discussed problems. In order to enable the general use of published data, various systems were developed and described. One of the most logical systems is the expression of the retention data in the retention index scale first proposed by E. Kovats of the Federal Institute of Technology, Zurich, Switzerland, in 1958. This system has a wide acceptance in Europe but is virtually unknown in the U.S., probably because all the basic papers were published either in German or French. At the recent Second International Symposium on Advances in Gas Chromatography, at Houston, Texas, Dr. Kovats summarized in detail the principles and advantages of the retention index system. In a subsequent lecture, Dr. A. I. M. Keulemans, professor at the Institute of Technology, Eindhoven, The Netherlands, discussed among other subjects, the error sources of this system and the possibilities for obtaining more accurate data. According to many practical gas chromatographers, the retention index system seems to be the most logical for the generalization of retention data. Thus it was felt that a condensation of the two papers as a Report for Analytical Chemists would contribute to better understanding in this field.

119. Fedeli, E., Cirimele, M.

The separation of phenylhydrazones of volatile carbonyl compounds by vapour phase chromatography.

J. CHROMATOGR. 15: 435, 1964.

120. Fenimore, D. C., Davis, C. M., Whitford, J. H., Harrington, C. A.

Vapor phase silylation of laboratory glassware.

ANAL. CHEM. 48(14): 2289-2290, 12/1-176.

121. Ferris, B. G.

Epidemiological studies on air pollution and health.

ARCH. ENVIRON. HEALTH 16: 541-555, 1968.

ABSTRACT: This paper deals with three different categories of atmospheric pollutants—general atmospheric pollutants, occupational-associated pollutants, and personal atmospheric pollution. The author is concerned only with the effects of atmospheric pollution on the development of chronic nonspecific respiratory disease. Most of the article deals with the type of general atmospheric pollution composed of sulfur compounds by comparing levels of London, New Hampshire and British Columbia, and the relation between respiratory disease at these locations and cigarette smoking. The effect of occupation was examined briefly using the workers in the pulp mill and the chlorine plant in Berlin, New Hampshire.

122. Ferris, B. G.

Health effects of exposure to low levels of regulated air pollutants: A critical review.

J. AIR POLLUT. CONTROL ASSOC. 28(5): 482-497, 1978.

ABSTRACT: Although this paper is not an exhaustive review of all studies dealing with various air pollutants, the author offers some philosophical comments, develops some concepts concerning the studies done to date and identifies certain problems that pertain to assessing any effects of any pollutant. The primary standards that have been established for the six regulated pollutants—TSP, SO_x, CO, NO₂, photochemical oxidants and nonmethane hydrocarbons—are examined with respect to epidemiologic studies: 1) CO—the present 8-hour and 1-hour standards seem quite adequate and should be protective even to exercising individuals. 2) Photochemical oxidants—eye, nose, and throat irritation occurs at 200-294 micrograms/cubic meter; long distance runners' performance is affected as is airway resistance of patients with chronic respiratory problems. 3) Hydrocarbons—lack of studies makes it difficult to comment on standards. 4) Nitrogen dioxide—based on limited data, the present standard of 0.05 ppm (24-hour average) seems reasonable. 5) Sulfates—insufficient data for sulfate standard evaluation.

123. Ferris, B. G., Jr., Speizer, F. E., Spengler, J. D., Dockery, D., Bishop, Y. M. M., Wolfson, M., Colome, S.

Relationship between outdoor and indoor air pollution and the implications on health.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: A large-scale investigation in six different communities on the health effects of air pollutants was begun in 1974. This report presents some preliminary findings. To assess the exposure in the six sites, a series of monitoring strategies was used to collect hourly and 24-hour samples. In each city, this included central station monitoring, indoor-outdoor monitoring and personal monitoring. The observations of others that gas cooking can produce higher levels for NO₂ indoors compared with outdoors has been confirmed by this study. Other findings included: lower SO₂ levels indoors and indoor mass respirable particulates influenced by the number of cigarettes smoked. Neutron activation shows that the composition of particulates indoors and outdoors can be quite different. The impact of these levels on health still needs to be evaluated.

124. Finberg, L.

Interaction of the chemical environment with the infant and young child

PEDIATRICS 53(5, Part II): 831-836, 1974.

ABSTRACT: The environment of an infant or child differs from that of the adult and general population due to size and physical and intellectual capabilities. Architecture, commerce, hygienic practices, recreation, and education all contribute to the unique exposure of young children to complex sources of chemical pollutants in the environment. This paper examines the contribution of each of the foregoing factors to the child's physiochemical milieu. The hazards of home, school, and hospitals, commercial products, and hygiene are discussed. In addition, the environmental hazard of lead and the relation between air pollution and asthma are mentioned.

125. Fink, J. N., Hensley, G. T., Schlueter, D. P., Unger, G. F.

Interstitial lung disease due to contamination of forced air systems.

ANN. INTERN. MED. 84: 406-413, 1976.

ABSTRACT: The health effects of breathing air contaminated with thermophilic actinomycetes originating from home or office forced air systems were investigated in this study. Eight patients with symptoms that suggested a hypersensitivity pneumonitis, but in whom no clear association between their illness and the inhalation of a specific dust could be made, were studied. Subsequent environmental and immunologic studies revealed almost all the patients' illnesses to be caused by contamination of the air system. A table providing information on the patients' sex, age, occupation, form of disease, probable source of antigen and pulmonary function is included.

126. Finnigan, R. E., Hoyt, D. W., Smith, D. E.

Priority pollutants, II: Cost-effective analysis.

ENVIRON. SCI. TECHNOL. 13(5): 534-541, 05/-/75.

127. Foote, R. S.

Mercury vapor concentrations inside buildings.

SCIENCE 177: 513-514, 1972.

ABSTRACT: Using a fine-mesh gold screen with a 29 percent mercury (Hg) collection efficiency at an airflow rate of 0.13 cubic meters/minute, the concentrations of elemental gaseous mercury were measured in several homes, offices, and laboratories in the Dallas area. Observed mercury concentrations in homes, offices, and laboratories were found to be

significantly higher than those in the ambient environment. Hg concentrations in the indoor environment are dependent on the type of paint used and the length of time since the area was painted. Levels in homes ranged from 68.2 nanograms/cubic meter in a residence painted 4 years previous to the study to 3,070 nanograms/cubic meter in a home painted 7 days before. The highest Hg concentrations observed were 5,680 nanograms/cubic meter in a doctor's office when a Hg thermometer had been broken in the past and 5,550 nanograms/cubic meter in a dental mixing area for silver amalgam. These compare with an average ambient concentration of 3.26 nanograms/cubic meter taken from Washington, D.C., Dallas, and San Francisco.

128. Fracchia, M. F., Schuette, F. J., Mueller, P. K.

A method for sampling and determination of organic carbonyl compounds in automobile exhaust.

ENVIRON. SCI. TECHNOL. 1(11): 915-922, 1967.

129. Frankel, L. S., Madsen, P. R., Siebert, R. R., Wallisch, K. L.

Selective retention by porous polymer adsorbents: Application to formaldehyde determination.

ANAL. CHEM. 44(14): 2401-2402, 12/—/72.

130. Fraser, P. J. B., Pearman, G. I.

Atmospheric halocarbons in the southern hemisphere.

ATMOS. ENVIRON. 12(4): 839-844, 1978.

ABSTRACT: This paper reports atmospheric CCl₃F, CCl₄ and CH₃CCl₃ concentration measurements obtained during 12 months of aircraft sampling and 6 months of surface measurements in Australia. These are preliminary results of a continuing programme aimed at describing the Southern Hemisphere atmospheric content of these gases and their variation in space and time, which relate to large scale atmospheric circulation.

131. Freed, D. J., Muisce, A. M.

In situ generation of standards for gas chromatographic analysis.

ANAL. CHEM. 49(1): 139-141, 1977.

132. Freeman, H. G., Grendon, W. C.

Formaldehyde detection and control in the wood industry.

FOR. PROD. J. 21(9): 54-57, 1971.

133. Fuchs, N. A.

The sampling of aerosols.

ATMOS. ENVIRON. 9: 697-707, 1975.

ABSTRACT: A review of the methods of representative aerosol sampling is provided in this paper. Various cases of sampling are treated—from vertical and horizontal streams in gas ducts, from rooms, and from the atmosphere. Taken into consideration were the various types of sampling probes and the effect of several factors on sampling efficiency (aspiration coefficient). Theoretical computations and experimental data on the value parameter and particle diffusivity are also discussed.

134. Gadbois, D. F., Mendelsohn, J. M., Ronsivalli, L. J.

Modification of Girard-T reagent method for concentrating carbonyl compounds for gas chromatographic analysis.

ANAL. CHEM. 37(13): 1776-1778, 1965.

135. Gadbois, D. F., Scheurer, P. G., King, F. J.

Analysis of saturated aldehydes by gas-liquid chromatography using methylolphthalimide for regeneration of their Girard-T derivatives

ANAL. CHEM. 40(8): 1362-1365, 07/1968.

136. Gage, S. J., Rausa, G. J.

Overview of the health effects of alternate energy sources. Paper No. 78-23.1, 1978.

ABSTRACT: In recent years the dependence of the United States' well-being on the capability to control our future energy sources has been realized. These realizations have led to the National Energy Plan which was implemented to encourage the use of small dispersed solar systems, geothermal systems, and combustible waste systems to provide approximately one-third of the market and to develop a combination of nuclear, fossil fuel systems, solar electric and geothermal central station systems. Unfortunately, the negative aspects of these forms of energy production and consumption are reasonably well documented and a major effort must be undertaken to attain and maintain a healthy "human environment." This paper identifies and evaluates the environmental problems of all advanced energy technologies. The authors also state the main objective of all energy-related environmental health research as being the development of tools and data base necessary to provide reliable estimates of the impact of alternative energy systems on the "human environment."

137. Gamble, J. F., McMichael, A. J., Williams, T., Battiselli, M.

Respiratory function and symptoms: An environmental-epidemiology study of rubber workers exposed to phenol-formaldehyde type resin.

AM. IND. HYG. ASSOC. J. 499-513, 09/1976.

ABSTRACT: Rubber workers in a tire plant exposed to a phenol-formaldehyde type resin—a hexamethylenetetramine-resorcinol (HR) adhesive system—reported an excess of acute symptoms and significant reductions in expiratory flow rates at low lung levels.

138. Gearhart, H. L., Pierce, S. K., Payne-Bose, D.

A sampling technique for organic components in human breath.

J. CHROMATOGR. SCI. 15(10): 480-484, 10/10/77.

ABSTRACT: An analytical sampling system was developed for trace organic components in breath. The sampling system was designed to maximize analyte concentrations while minimizing interference from exogenous contamination. Details of the sampling system design and its operation are presented.

139. Glazer, N.

The regulation and control of carbon monoxide in enclosed parking garages. Paper No. 78-4.6, 1978.

ABSTRACT: Following an incident brought on by abnormal circumstances in Philadelphia, Pennsylvania, when more than 100 persons were made sick by carbon monoxide and exhaust fumes in an underground parking facility, an investigation was undertaken. The present study reports on this investigation and also on the criteria for ventilation in these underground garages which was formalized as a result of the Philadelphia incident. This proposed regulation states that the ventilation system of parking garages "shall be

designed and maintained to limit internal ambient concentrations of carbon monoxide to a maximum average of 50 ppm by volume during any 8 consecutive hours; all parking garages commencing construction after the effective date of this regulation...shall be equipped with an automatic CO detection and warning system...an Emergency Action Procedure shall be prepared to take effect when...CO concentrations at any monitoring point in the garage exceeds 200 ppm during any 15-minute period.

140. Gold, A., Dube, C. E., Perni, R. B.

Solid sorbent for sampling acrolein in air.

ANAL. CHEM. 50(13): 1839-1841, 11/--/78.

ABSTRACT: Activated 13X molecular sieves were found to be an excellent solid sorbent for sampling acrolein in air, providing quantitative trapping and recovery and stability of stored samples. Although water vapor decreases acrolein breakthrough times, a sample volume of 8 L/g sieve sorbent is permissible at 100% relative humidity, allowing determination of acrolein at sub-ppm levels even under such unfavorable conditions. The dynamic adsorption isotherm of acrolein on 13X sieves was determined and found to be adequately described by a Langmuir curve. Statistical Moments Theory was applied to breakthrough data to estimate breakthrough times of acrolein over a range of concentrations. Field trials indicate that 13X sieves would also be suitable for sampling other low molecular weight aldehydes, short chain alcohols, and volatile ketones.

141. Goldman, F. H., Yasoda, H.

Collection and estimation of traces of formaldehyde in air.

IND. ENG. CHEM., ANAL. ED. 15(6): 377-378, 06/15/43.

142. Goldwater, L. J., Manoharan, A., Jacobs, M. B.

Suspended particulate matter, dust in "domestic" atmosphere.

ARCH. ENVIRON. HEALTH 2: 511-515, 1961.

ABSTRACT: The objective of this study was to conduct a preliminary investigation of the air inside domestic environments--identified as homes, offices, and nonfactory workplaces. Both indoor and outdoor samples were collected at 30 locations in and around New York City, and the total weight and ash content of these samples were determined. The suspended particulate (TSP) matter and ash were analyzed as a function of indoor location, furnishings, carpeting, frequency of cleaning and method of cleaning. TSP concentrations ranged from 60-539 micrograms/cubic meter in living rooms; 61-250 micrograms/cubic meter in bedrooms, and 95-211 micrograms/cubic meter in offices. The differences between the ash content and indoor and outdoor air were statistically significant.

143. Green, G. H.

The effects of indoor relative humidity on absenteeism and colds in schools.

ASHRAE J. 17(1): 57-62, 1975.

ABSTRACT: A series of measurements of indoor temperature and humidity made by the Division of Building Research (DBR), National Research Council of Saskatoon, Saskatoon, Canada, in six primary schools (grades 1-8; ages 6-14) in 1960-61 was used in a preliminary study of the effect of indoor relative humidity on absenteeism. In 1970 a plot of relative humidity versus total absenteeism (absenteeism due to all causes) was made from the data taken by DBR in 1960-61 for the six schools. The correlation coefficient of this data $r = 0.93$ exceeds the 5 percent level of significance $r_{0.1} = 0.917$. A study was then conducted in the winter of 1971-72 with the same six schools plus six others in an attempt to confirm the results and find reasons for the correlation. These studies indicated that there was a reduction in absenteeism with increase in the relative humidity of the space; which also support the speculation that reduction in absenteeism in the Canadian schools is a direct result of reduction in upper respiratory diseases at the higher indoor relative humidities. A possible reason behind the reduction in such diseases is made in a discussion of the school as a means for transmitting airborne disease and in laboratory investigations which have established the effect of relative humidity on the survival rate of airborne bacteria.

144. Gregory, C. J., Manganello, R. M.

Mechanism of sulfur dioxide adsorption by natural and synthetic textile fibers.

J. AIR POLLUT. CONTROL ASSOC. 20(7): 471, 1970.

ABSTRACT: Fiber surfaces provide a wide variety of possible sites for sulfur dioxide (SO₂) removal in the indoor environment. This study investigated the SO₂ uptake by various textile fibers with respect to mechanisms involving solutions of the gas in moisture held by the fibers and chemical reaction at specific sites on the fibers. The fibers were exposed to a SO₂ concentration of 2.92 micrograms/liter at 20 degrees C and a relative humidity of 84 percent. The nylon samples exhibited the least capacity for SO₂ absorption; wool and cotton have a natural buffering capacity which permits an increase in the solubility of atmosphere SO₂.

145. Grob, K., Grob, G.

Gas-liquid chromatographic-mass spectrometric investigation of C₆-C₂₀ organic compounds in an urban atmosphere.

J. CHROMATOGR. 62(1): 1-13, 10/28/71.

ABSTRACT: Qualitative and quantitative investigations were made on the C₆-C₂₀ volatile organic substances in the air of Zurich. The technique of trace analysis on high resolution capillary columns was developed further. To trap the organics, a specially designed filter was used containing 25 mg of cigarette filter charcoal. Important information about the adsorption/desorption mechanism was obtained by using two or more filters in series. The extraction of the filters with carbon disulphide is described. A mass spectrometer (CMS from Varian MAT, Bremen, G.F.R.) specially designed to meet the requirements of coupling with high resolution gas chromatography was used. The majority of the hundred and eight substances identified were aliphatic and aromatic hydrocarbons. Among substances representing other groups were found benzaldehyde and several of its alkyl derivatives which may be oxidation products of aromatic hydrocarbons. The principle of quantitative determination is discussed and is applied to the most volatile part (benzene through C₃-substituted benzenes) of the spectrum.

146. Grob, K. Jr., Grob, G., Grob, K.

Comprehensive, standardized quality test for glass capillary columns.

J. CHROMATOGR. 156: 1-20, 1978.

ABSTRACT: A quality test procedure for glass capillary columns is described that offers the following information: adsorption of hydroxyl function, adsorption of aldehyde function (an entirely independent characteristic), separation efficiency, acid-base behaviour and film thickness. This is the basic information needed for evaluating a column and for deciding the specific purpose to which the column can be applied. Important further progress consists in the way this information is obtained. A single run is needed, i.e., no repeated runs are necessary in order to find optimal conditions. One test mixture produces the indicated information for all liquid phases. The standardization of conditions is such that the characteristics of columns with different liquid phases can be compared directly. Finally, the information is quantitative, which greatly increases its usefulness. Only quantitative information has been able to show that the common qualitative tests, e.g., for acid-base behaviour, have often produced misleading interpretations. Exact directions for the test procedure and several practical examples are presented.

147. Halasz, I.

Concentration and mass flow rate sensitive detectors in gas chromatography.

ANAL. CHEM. 36(8): 1428-1430, 07--/64.

ABSTRACT: The detectors are grouped into two families. The characteristic features of these groups are described. The advantages of the mass flow rate sensitive detectors in quantitative analysis are set forth. Use of a scavenger gas in concentration sensitive

detectors is discussed.

148. Hales, C. H., Rollinson, A. M., Shair, F. H.

Experimental verification of the linear combination model for relating indoor-outdoor pollutant concentrations.

ENVIRON. SCI. TECHNOL. 8(5): 452-453, 1974.

ABSTRACT: The purpose of this investigation was to compare model predictions with indoor air pollutant concentrations measured as a function of time at various positions throughout a rather large laboratory office building. A ventilation (linear combination) model proposed by Shair and Heitner which relates indoor concentrations of a pollutant to those outside was used to predict ozone (O₃) levels. The linear combination model appears to provide an "upper bound" in relating indoor O₃ concentrations to those outside. Tests indicate that the model is in good agreement with O₃ concentrations in rooms and hallways. However, ozone levels vary somewhat between rooms depending on local ventilation and geometric parameters.

149. Halpern, M.

Indoor/outdoor air pollution exposure continuity relationships.

J. AIR POLLUT. CONTROL ASSOC. 28(7): 689-691, 1978.

ABSTRACT: In this study the indoor/outdoor pollution exposure continuity relationships are considered in an attempt to define the major parameters determining the relation. This study used particulate lead (Pb) as an index contaminant to consider and evaluate these relationships. Air samples were collected on Nuclepore membrane filters; the primary filter had a pore size of 8.0 micrometers, with a secondary filter having a pore size of 0.8 micrometers. The author defined all matter that reached the secondary filter as respirable particulates. Indoor/outdoor measurements were made at four locations in the New York City area. These sites included a fairly new air-conditioned apartment building in the Bronx, a storeroom in the American Museum of National History, and a pre-World War II apartment in a commercial zone. It was found that indoor particulate Pb levels were generally lower than corresponding ambient Pb levels, and that indoor levels followed outdoor concentrations directly. The results indicated significant differences in indoor/outdoor levels, demonstrating the importance of considering parameters other than outdoor pollutant levels in determining indoor air quality.

150. Halvarson, H.

Quantitative gas-chromatographic analysis of micro amounts of volatile carbonyl compounds via their DNPH (2,4-dinitrophenylhydrazone) derivatives.

J. CHROMATOGR. 57(3): 406-409, 1971.

151. Halvarson, H.

The qualitative and quantitative evaluation of the low-molecular-weight monocarbonyls in meat products.

J. CHROMATOGR. 66: 35-42, 1972.

152. Hammarstrand, K., Varian Instrument Division. Palo Alto CA.

A sensitive GC method for formaldehyde determinations. 3 p.

ABSTRACT: Dimedone is used as a reagent for the aldehydes so that the FID can be employed to measure trace formaldehyde levels. (Water is split off.) Fabric samples were used to test the procedure.

153. Hans, J. M., Jr., Douglas, R. L.

Radiation survey of dwellings in Cane Valley, Arizona, and Utah, for use of uranium mill tailings. Technical Note No. ORP/LV-75-2, 1975.

ABSTRACT: A radiation survey was conducted in the Cane Valley area of Monument Valley, on the Navajo Reservation, to identify dwellings in which uranium mill tailings had been used and to assess the resulting radiation exposures. Sixteen of the 37 dwellings surveyed were found to have tailings and/or uranium ore used in their construction. Tailings were used in concrete floors, exterior stucco, mortar for stone footings, cement floor patchings, and inside as cement "plaster." Uranium ore was found in footings, walls, and in one fireplace. Other structures, not used as dwellings, were also identified as having tailings and ore use. Gamma ray exposure rates were measured inside dwellings and structures identified as having tailings and/or ore used in their construction. Indoor radon progeny samples were collected in occupied dwellings where practical. The highest net average gamma exposure rate measured was 332 microrads/year at 3 feet above the floor, and the highest net corrected average exposure rate at floor level was 402 microrads/year. The highest indoor radon progeny level measured during the survey was 0.046 net Working Level (WL).

154. Harke, H. B.

The problem of "passive smoking".

MUENCH. MED. WOCHENSCHR. 112(51): 2328-2334, 1970.

ABSTRACT: The problem of involuntary intake of smoke by the nonsmoker is reported in this document. Tobacco smoke components—nicotine and carbon monoxide (CO)—were measured in two smoke-filled rooms. The influence of the room ventilation on the concentrations of nicotine and carbon monoxide was also investigated. An average of 0.50 milligrams nicotine/cubic meter and 48 ppm CO were measured in the test room after smoking 42 cigarettes in 16-18 minutes. With moderate ventilation, these concentrations decreased by about 80 percent. Under extreme conditions (a room without ventilation) the COHb value of the smoker rose an average 4.1 percent absolute, while in the nonsmoker it rose an average of 1.2 percent absolute.

155. Harkin, J. M., Obst, J. R., Lehmann, W. F.

Visual method for measuring formaldehyde release from resin-bonded boards.

FOR. PROD. J. 24(1): 27-30, 01/--/74.

ABSTRACT: An alkaline solution of purpald absorbs formaldehyde vapor quantitatively from air and turns purple. Under standard conditions, the intensity of the color can be used to measure release of formaldehyde from particleboard or fiberboard bonded with urea-formaldehyde or phenol-formaldehyde resins. An airflow test and a spot test using purpald are outlined. These tests can be used for grading boards or for determining satisfactory curing. Because of their simplicity and rapidity, these tests could be used routinely or in spot checks in board manufacturing plants.

156. Hathorn, J. W., III.

Systems approach to air quality programs. Paper No. 78-2.7, 1978.

ABSTRACT: An efficient analysis of the impact of a physical action on people and on the environment can be made without omitting any factors using a systems approach. The approach developed in this paper is applicable to any area of environmental impact analysis, but in this paper it applies only to the impact of gaseous wastes on air quality. Although the author has directed his research along the lines of ambient pollution, certain aspects of his approach could be applied to indoor pollution and in determining total exposure.

157. Hauser, T. R., Cummins, R. L.

Increasing sensitivity of 3-methyl-2-benzothiazolone hydrazone test for analysis of aliphatic aldehydes in air.

ANAL. CHEM. 36(3): 679-681, 03/--/64.

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158. Henderson, J. J., Benson, F. B., Caldwell, D. E.

Indoor-outdoor air pollution relationships, Volume II: An annotated bibliography. AP-1126, 1973.

ABSTRACT: This document provides an abstracted bibliography on works dealing with a relation to indoor-outdoor air pollution relationships through 1973. An index referring to subjects, authors, and titles is provided.

159. Hester, N. E., Stephens, E. R., Taylor, O. C.

Flourocarbons in the Los Angeles Basin.

J. AIR POLLUT. CONTROL ASSOC. 24(6): 591-595, 1974.

ABSTRACT: Ambient air concentrations of flourocarbon 11 and flourocarbon 12 were measured using a gas chromatograph equipped with a pulsed, electron capture detector at several locations near Los Angeles. During clear weather, as opposed to moderately smoggy days, both flourocarbon 11 and 12 levels averaged about 25 percent less. A concentration versus altitude study clearly revealed that flourocarbons are trapped by an inversion layer. Flourocarbon levels in homes and public buildings were compared with ambient air levels. This revealed indoor levels in some structures to be as much as several thousand times as high as outdoor levels. Flourocarbon 11 concentrations ranged from 0.22 to 12 ppb; flourocarbon 12 concentrations ranged from 0.3 to 510 ppb. Also, there do not appear to be any typical levels in homes.

160. Hill, A. C.

Vegetation: A sink for atmospheric pollutants.

J. AIR POLLUT. CONTROL ASSOC. 21(6): 341-346, 1971.

ABSTRACT: The possibility of vegetation being an important sink for gaseous air pollutants was investigated in this study. Plant pollutant uptake measurements were made utilizing typical vegetation canopy. To provide a basis for evaluating vegetation as a sink, chambers were designed specifically to study gaseous exchange. The data indicate that an alfalfa canopy removed gases from the atmosphere in the following order: hydrogen flouride > sulfur dioxide > chlorine > nitrogen dioxide > oxone > PAN > nitric oxide > carbon monoxide. Wind velocity above the plant canopy, height of the canopy, and light intensity were shown to affect pollutant removal.

161. Hill, R. H., Jr., McCammon, C. S., Saalwaechter, A. T., Teass, A. W., Woodfin, W. J.

Gas-chromatographic determination of vinyl chloride in air samples collected on charcoal.

ANAL. CHEM. 48(9): 1395-1398, 08/--/76.

ABSTRACT: Studies of over 20 different solid sorbents, particularly charcoal, revealed significant increases in breakthrough volumes with decreases in concentration or sampling flow rates. At low sampling flow rates, coconut shell charcoal had a good capacity and was selected as the most practical sorbent. Vinyl chloride was desorbed from charcoal with carbon disulfide and determined by gas chromatography. Recoveries were usually 80% or better. Samples of vinyl chloride on charcoal were found to be stable for at least three weeks when stored at ambient or sub-ambient temperatures. At ambient conditions, vinyl chloride migrated to the back section of the charcoal tubes within a few days. The overall precision of the method was indicated by a relative standard deviation of 7.5% for identical samples analyzed over a three-week period.

162. Hill, T. L.

Theory of multimolecular adsorption from a mixture of gases.

J. CHEM. PHYS. 14(4): 268-275, 04/--/46.

ABSTRACT: By making use of the evaporation-condensation properties of liquid mixtures, the Brunauer-Emmett-Teller theory of multimolecular adsorption is extended to mixtures of gases. No satisfactory experimental data are available at the present time with which to test the theory.

163. Himmel, R. L., Tausch, E. A., DeWerth, D. W.

Further measurements of emissions from gas-fired appliances. Paper No. 77-24.4, 1977.

ABSTRACT: This paper summarizes the results of continuing studies of residential and commercial gas appliances with respect to the emissions of carbon monoxide (CO), nitric oxide (NO), nitrogen dioxide (NO₂), sulfur oxides (SO_x) and unburned hydrocarbons which they can produce. Emission levels determined for ranges, forced air furnaces, water heaters, and room heaters are presented. Performance factors which influence NO_x emissions, NO_x reduction experiments, and the effect of performance variables on emission levels are also discussed. It was found that, except for range top burners, there is little or no effect on NO_x emissions of gas-fired appliances at different altitudes when operated at the full rated fuel input. The results of these studies indicate that when appliances are derated at higher altitudes in accord with ANSI recommendations, there is probably a reduction in NO_x emissions of range-top burners.

164. Hinds, W. C., Forst, M. W.

Concentrations of nicotine and tobacco smoke in public places.

NEW ENGL. J. MED. 292: 844-845, 1975.

ABSTRACT: In this study, levels of tobacco smoke in public places were estimated to evaluate the health implications for nonsmokers. Nicotine was chosen as a tracer for tobacco smoke since it is specific for tobacco smoke. Nicotine concentrations in a commuter train, bus, bus waiting area, airline waiting area, restaurant, cocktail lounge and a student lounge were gathered. From these values, tobacco smoke concentrations were calculated along with the equivalent filter cigarettes smoked per hour for the nonsmoking inhabitant of the space. The data collected by this study suggest that although tobacco-smoke concentrations often exceed standards for clean air, observed levels would not be expected to produce the strong public reaction to tobacco smoke.

165. Hlavay, J., Guilbault, G. G.

Applications of the piezoelectric crystal detector in analytical chemistry.

ANAL. CHEM. 49(13): 1890-1898, 11/--/77.

ABSTRACT: Applications of the piezoelectric quartz crystal in different areas of analytical chemistry are reviewed. One of the most useful analytical methods is in detection of different gases in ambient air in the ppm and ppb concentration range. The usefulness of the piezoelectric crystal in gas chromatography and liquid chromatography as a sorption detector, in polymer research, for the determination of water and for micro weighing with a quartz crystal, are also detailed. The commercial availability of piezoelectric devices is discussed.

166. Ho, J. Shou-Yien

Collaborative study of reference vinyl chloride charcoal tubes.

AM. IND. HYG. ASSOC. J. 40(3): 200-206, 03/--/79.

ABSTRACT: The primary objective of this study was to determine the variation and stability of vinyl chloride collected on charcoal tubes as well as the accuracy and precision of the laboratory analytical result through a collaborative test. In this collaborative test, the reference charcoal tubes were carefully prepared by a permeation technique and sent to collaborative laboratories. Each laboratory analyzed a set of four charcoal tubes containing two concentration levels of vinyl chloride with two tubes at each concentration level. Replicate determinations were performed on each charcoal tube. The statistical analysis outlined by AOAC was used to analyze the laboratory data. The statistical data analysis provided estimates of error for sample generation (sample variation), of instrument precision, and of interlaboratory error.

167. Hoess, V. R.

Cigarette smoke in closed spaces.

ENVIRON. HEALTH PERSPECT. 2: 117-128, 1972.

ABSTRACT: This study describes a basic approach for the evaluation of cigarette smoke in closed spaces. Factors involved in a person's exposure to sidestream smoke were defined, and commonly found averages of such factors were used to determine common exposures. Information not available from the existing literature was developed through experimental research. Finally, all important factors were combined to calculate the extent of passive smoking and pollutant concentration levels in smoky atmospheres. Some of the major results drawn from this study include: 1) Sidestream smoke of one cigarette contains 7.5 milliliters of CO, 4.7 greater than that in the mainstream smoke. 2) Passive smoking can be measured using "Cigarette Equivalents" (C.E.). An estimated 0.01-0.20 C.E. per hour is inhaled in the average closed space. 3) Experimental data under average indoor conditions reveal that total particulate matter may exceed Federal air quality standards.

168. Holzer, G., Oro, J., Bertsch, W.

Gas chromatographic-mass spectrometric evaluation of exhaled tobacco smoke.

J. CHROMATOGR. 126: 771-785, 1976.

ABSTRACT: The impact of cigarette smoking on the distribution of organic substances in ambient air has been determined for the intermediate volatility range. A simple sampling procedure was employed, involving gas-solid adsorption onto an organic polymer followed by direct thermal elution onto a glass capillary column. Aliphatic and substituted aromatic hydrocarbons are predominant in urban atmospheres. Depending on location and weather conditions the total concentration of such volatiles can differ by as much as a factor of 20. This high background variation makes it difficult to analyze for trace substances with low odor threshold values, such as encountered in cigarette smoke. Standard cigarettes were smoked in a relatively small room, having no air filtration system. Air samples of approximately 3.5 l were taken. The amount of volatiles added to air by cigarette smoking is insignificant. Substances were analyzed and identified by gas chromatography and gas chromatography-mass spectrometry with glass capillary columns. Many compounds reported in cigarette smoke condensate have been confirmed.

169. Holzer, G., Shanfield, H., Zlatkis, A., Bertsch, W., Juarez, P., Mayfield, H., Liebich, H. M.

Collection and analysis of trace organic emissions from natural sources.

J. CHROMATOGR. 142: 755-764, 11/11/77.

ABSTRACT: Samples from rural areas contain small amounts of hydrocarbons and halocarbons which are also found in urban areas. It appears that compounds which are associated with plant life such as terpenoids greatly vary in concentration, depending primarily on season and meteorological conditions. It also appears that the type of vegetation in the immediate vicinity of the sampling location plays a strong role in the nature and distribution of the volatiles. Several oxygenated classes of compounds (alcohols, ketones and esters) have been identified in rural air samples.

170. Horton, R. J. M.

Help wanted.

ASHRAE J. 75-76, 01/--/76.

ABSTRACT: An ASHRAE forum on "Possible Undesirable Effects of Air Conditioning" was held, and this article presents a description of the problem and solicits more information on the subject. The nature and source of each undesirable effect should be identified, its seriousness and frequency determined, and the possibilities of elimination resolved. With respect to indoor air quality, a number of problems have been identified. The distribution and inadequate removal of gaseous contaminants are affected by the air conditioning system; concern for injury from ozone generation by air cleaning and other indoor equipment

171. Hoshika, Y., Takata, Y.

Gas chromatographic separation of carbonyl compounds as their 2,4-dinitrophenylhydrazones using glass capillary columns.

J. CHROMATOGR. 120(2): 379-389, 05/26/76.

172. Hoshika, Y.

Simple and rapid gas liquid chromatographic analysis of trace concentrations of acetaldehyde in urban air.

J. CHROMATOGR. 137(2): 455-460, 07/21/77.

ABSTRACT: A simple and rapid gas liquid-solid chromatographic method for the analysis of trace concentrations of acetaldehyde in urban air (in the Nagoya area) was developed, with the use of cold trapping with liquid oxygen. In the analytical main column the conditions were: stationary phase, Triton X-100 (0.4%); support, Carbowack B (60-80 mesh); glass column, 1.5 x 3 mm I.D.; column temperature, 75 degrees; carrier gas (nitrogen) flow-rate, 50-80 ml/min. In the cold trapping pre-column the conditions were: stationary phase, Tris (2-cyanoethoxy) propane (25%); support, Shimalite (AW, DMCS) (60-80 mesh); glass column, 31 cm x 4 mm I.D.; operating temperature for the trapping, -183 (liquid oxygen temperature); operating temperature for injection of the condensed sample into the gas chromatograph, increased from -183 degrees to +100 degrees for 2 min. The acetaldehyde peak was identified by the disappearance method with a 2,4-dinitrophenylhydrazine orthophosphoric acid-glass beads column. The ranges and average concentrations of acetaldehyde detected in 13 urban air samples were 1.5-9.6 and 4.7 PPB, respectively.

173. Hoshika, Y., Muto, G.

Gas-liquid-solid chromatographic separation of lower aliphatic carbonyl compounds.

J. CHROMATOGR. 150(1): 254-256, 03/11/78.

ABSTRACT: The gas-liquid-solid chromatography (GLSC), using graphitized carbon black as a support, for the analysis of lower boiling compounds has been widely reported by DiCorcia et al. These methods had a high resolving power for the separation, and no adsorption or tailing with polar compounds such as lower aliphatic amines, alcohols, phenols and fatty acids. Of the column packings used in these methods, 0.4% Triton X-100 on Carbowack A has been used for the separation of acetaldehyde and other lower-boiling polar compounds such as methanol, ethanol, etc. With this method, but using Carbowack B as support, acetaldehyde separated completely from other lower-boiling compounds such as lower hydrocarbons, amines, ammonia, chlorides, alcohols and esters, compounds which are present in general environmental air. However, the column packing was not sufficient for the separation of propion-aldehyde, acrolein and acetone, compounds which have equal numbers of carbon atoms (C3). In this note, in order to achieve a rapid and simple separation of the nine lower aliphatic carbonyl compounds, tris-(2-cyanoethoxy)propane (TCEP) was used as a stationary phase for the column packing with Carbowack B as support. This stationary phase is strongly polar. It was found that 5% TCEP on Carbowack B (60-80 mesh) in a glass column (1.5 m X 3 mm I.D.) at 70 degrees gave the best results. The peaks of propionaldehyde, acrolein and acetone were separated completely within 5 min.

174. Hrivnac, M., Frischknecht, W., Cechova, L.

Gas chromatography multidetector coupled to a glass capillary column.

ANAL. CHEM. 48(6): 937-940., 05/--/76.

ABSTRACT: Sulfur and/or nitrogen-containing compounds are sensorically important constituents of many flavor materials. Their presence in complex mixtures can be elegantly detected by means of the GC-MS coupling technique, provided that well-defined mass spectra of the constituents are obtained. The application of glass capillary columns with their high resolving power, therefore, will in many cases be of advantage. The authors set out to couple a glass capillary column to a multiple detector arrangement consisting of a FID (serving as monitoring device), a sulfur detector, and a nitrogen detector, plus a

sniffing port for the sensoric evaluation of column effluent. Since the authors desired simultaneous detection, the column effluent was split by a means of a four-way splitter before entering the detectors.

175. Hrubesh, L. W.

Microwave rotational spectroscopy: A physical technique for specific pollutant monitoring.
WMO No. 368

SPECIAL ENVIRONMENTAL REPORT NO. 3: OBSERVATION AND MEASUREMENT OF ATMOSPHERIC POLLUTION. PROCEEDINGS OF A TECHNICAL CONFERENCE ON THE OBSERVATION AND MEASUREMENT OF ATMOSPHERIC POLLUTION (TECOMAP) JOINTLY ORGANIZED BY THE WORLD METEOROLOGICAL ORGANIZATION AND THE WORLD HEALTH ORGANIZATION. 525-537

176. Hrubesh, L. W.

Microwave rotational spectroscopy: Technique for specific pollutant monitoring.

RADIO SCI. 8(3): 167-175, 1973.

177. Hudson, F. L., Grant, R. L., Hockey, J. A.

Pick-up of sulfur dioxide by paper.

J. APPL. CHEM. 14: 444-447, 1964.

ABSTRACT: The authors of this study have further developed a method, using radioactive sulfur dioxide (SO₂) for examining the effects of variables such as humidity, temperature, and furnishings on the affinity of SO₂ for paper. The radiotracer techniques have enabled the adsorption of SO₂ to be studied at vapor phase concentrations down to 0.75 ppm under closely controlled conditions of temperature and relative humidity. The temperature coefficient indicates that a diffusion process determines the rate of uptake which is also almost linearly related to moisture content, being increased under moist conditions.

178. Hushes, K. J., Hurn, R. W.

A preliminary survey of hydrocarbon-derived oxygenated material in automobile exhaust gases.

J. AIR POLLUT. CONTROL ASSOC. 10: 367-373, 1960.

179. Hushes, K. J., Hurn, R. W., Edwards, F. G.

Separation and identification of oxygenated hydrocarbons in combustion products from automotive engines.

GAS CHROMATOG., INTERN. SYMPOSIUM, 2ND, EAST LANSING, MICH., 1959. 171-182, 1961.

180. Hunt, C. M., Cadoff, B. C., Powell, F. J.

Discussion of a paper by Yocom and Cote.

ASHRAE TRANS. 77, Part I: 70-71, 1971.

ABSTRACT: The discussion provided in this paper supplements the observations made by Yocom and Cote in their study of the comparisons between composition of indoor and outdoor dust. Hunt, Cadoff, and Powell show the absorption spectra of indoor dust, outdoor dust, and tobacco smoke. The authors have noted that a higher fraction of benzene-soluble matter exists in the dust collected from indoor air than in that from outdoor air. The indoor dust spectrum showed three peaks at 3.1, 7.1, and 9.1 micrometers--which resemble the spectra of ammonium sulfate or ammonium sulfite. At the present time, however, no indoor source of ammonium sulfate generation is apparent. It possibly could originate from the

ambient environment, but is too fine to be captured by filters or fallout in the building space.

181. Hunt, C. M., Cadoff, B. C., Powell, F. J.

Indoor air pollution status report. NBS Project 4214101 23 p., 1971.

ABSTRACT: A project was activated in the Environmental Engineering Section of the Building Research Division at the National Bureau of Standards for the purpose of identifying indoor pollutants, both gaseous and particulate, comparing indoor/outdoor pollutant relationships, and developing experimental and mathematical methods for analyzing the way in which a building handles air pollutants. The purpose of this report is to describe the status of the work, to outline plans for future work, and to suggest areas where the analytical capability must be improved if a strong program in indoor air pollution is to be achieved.

182. Huysen, C.

The use of nitrogen dioxide permeation tubes.

ATMOS. ENVIRON. 5: 55, 1971.

183. Ikeda, S.

Rapid determination of formaldehyde by short-circuit argentometric amperometric titration using a rotating platinum microelectrode.

ANAL. CHEM. 46(11): 1587-1588, 09/--/74.

184. Imura, S., Minemura, N.

Secondary treatment of plywood and particle board for non-smell grade.

J. HOKKAIDO FOR. PROD. RES. INST. 305: 1-5, 06/--/77.

ABSTRACT: Various methods have been introduced to reduce the formaldehyde emission from plywood and particleboard. The main cause of the emission is the use of urea-formaldehyde resin (UF resin) as a binder of plywood and particleboard. In this paper, therefore, a combination method of a formaldehyde scavenger and paint coating is discussed as a simple method for reducing formaldehyde. There is a previous report about impregnation of formaldehyde scavengers. However, the purpose of this study is to reduce the total volume of a scavenger as painting is introduced. After the appropriate scavenger is selected as a result of coating strength and photoresistance, the best amount of the scavenger impregnated to plywood is determined and the change of formaldehyde emission on a durability test is checked.

185. Jackson, J. O., Warner, P. O., Mooney, T. F.

Profiles of benzo-a-pyrene and coal tar pitch volatiles at and in the immediate vicinity of a coke oven battery.

AM. IND. HYG. ASSOC. J. 276-281, 05/--/74.

ABSTRACT: A 70-oven coke manufacturing plant has been surveyed for concentrations of cyclohexane-soluble coal tar pitch volatiles (CTPV) and benzo-a-pyrene (BaP). Three off-battery and three on-battery sampling sites were selected, with 45 samples collected during July 1970. The on-battery locations showed measured levels of 0.0313 to 1.67 milligrams of CTPV and 0.172 to 15.9 micrograms of BaP per cubic meter; the off-battery concentrations were 0.0072 to 0.322 milligrams of CTPV and 0.021 to 1.18 micrograms of BaP per cubic meter. Cyclohexane-soluble CTPV expressed here reflect higher benzene-soluble CTPV concentrations, since benzene is more polar than cyclohexane. BaP was determined analytically by spectrophotofluorometry preceded by instant thin-layer chromatographic (ITLC) separation of the cyclohexane-soluble residue in pentane. The influence of adjacent batteries and subsequent correlation with wind direction are also discussed.

186. Jackson, M. W.

Effect of catalytic emission control on exhaust hydrocarbon composition and reactivity. SAE Paper No. 780624

GM EMISSION REPORT: NUMBER 5.

ABSTRACT: Exhaust gases from fourteen 1970-4 model and twenty 1975-7 model General Motors cars were collected during 1975-8 Federal Test Procedure tests and analyzed by gas chromatography. Hydrocarbon reactivity was calculated from the chromatographic analyses, using several reactivity scales. The use of oxidation catalytic converters on the 1975-7 model cars greatly changed the exhaust hydrocarbon composition in comparison to 1970-4 model cars. In general, such use caused individual paraffins to increase in carbon percent and individual olefins and acetylene to decrease. For example, the methane carbon percent was 5.0 for 1970-4 model cars (nonconverter cars) and 14.5 for converter cars; ethylene percent was 12.5 for nonconverter cars and 7.4 for converter cars; propylene was 6.5 for nonconverter cars and 2.9 for converter cars; and acetylene was 7.9 for nonconverter cars and 2.2 for converter cars. Because of these large changes in hydrocarbon composition, each of the reactivity scales evaluated indicated that converter cars produced exhaust hydrocarbon mixtures that were less reactive than those of nonconverter cars. The reductions in reactivity per gram ranged from about 10 to 35 percent.

187. Jacobs, M. B., Braverman, M. M., Hochheiser, S.

Ultramicrodetermination of sulfides in air.

ANAL. CHEM. 29(9): 1349-1351, 09/--/57.

ABSTRACT: Hydrogen sulfide and other sulfides can be determined in the part per billion range in air if the air is bubbled through an absorption mixture of an alkaline suspension of cadmium hydroxide contained in a Greenburg-Smith impinger. Rates as high as 1 cubic foot per minute can be used, or 0.1 cubic foot per minute with a midset impinger. The concentration of the trapped sulfides is then estimated by the methylene blue method. Procedures for use both in the laboratory and in the field are detailed.

188. Jacobs, M. B., Manoharan, A., Goldwater, L. J.

Comparison of dust counts of indoor and outdoor air.

INT. J. AIR WATER POLLUT. 6: 205-213, 1962.

ABSTRACT: The dust count and particle size of suspended particulate matter of indoor and outdoor air was determined at 30 locations including homes, business offices, and offices and laboratories of Columbia University. A special adapter was developed so that a high volume sampler could be used for sampling for dust counts by the membrane filter method. The range of dust counts were for indoor air: living rooms, 1.7 to 24.3; bedrooms, 4.2 to 34.9; and offices, 4.0 to 53.4 million particles per cubic foot (MPPCF). The corresponding range for all the outdoor samples was 2.2 to 53.1 MPPCF. The median particle size was about 0.6; 85 percent of the indoor particles and 74 percent of the outdoor particles were 1 micrometer or less in size.

189. Jacobs, M. B., Goldwater, L. J., Fergany, A.

Comparison of suspended particulate matter of indoor and outdoor air.

INT. J. AIR WATER POLLUT. 6: 377-380, 1962.

ABSTRACT: Suspended particulate matter was determined at 21 locations--17 homes and 4 small manufacturing plants, for both indoor and outdoor atmospheres in this study. Observed indoor samples for all buildings ranged from 90 to 957 micrograms/cubic meter, with an average of 284.8 micrograms/cubic meter. If, however, the four factory sites are omitted, the indoor samples ranged from 90 to 462 micrograms/cubic meter, with an average of 238.6 micrograms/cubic meter. The outdoor samples ranged from 101 to 424 micrograms/cubic meter, with an average of 243.6 micrograms/cubic meter. These values are in agreement with other work in this field. Samples were taken in the period from late April to early June, as windows in the rooms were generally closed. There was some indication that carpeted rooms are dustier than uncarpeted rooms, but statistical

evaluation shows no significant difference.

190. Jacobsen, N. W., Dickinson, R. G.

Spectrometric assay of aldehydes as
6-mercapto-3-substituted-s-triazolo(4,3-b)-s-tetrazines.

ANAL. CHEM. 46(2): 298-299, 02/--/74.

ABSTRACT: The formation of magenta and violet colored 6-mercapto-3-substituted-s-triazolo(4,3-b)-s-tetrazine derivatives (II) from 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole (I) has been described as the basis of a sensitive and specific qualitative test for aliphatic and aromatic aldehydes. The intense colors which were produced in these tests by the absorption of light by the anion of the 6-mercapto-s-triazolo(4,3-b)-s-tetrazine system were recognized as being the basis of a new and useful quantitative test for aldehydes.

191. Jeffries, H. E., Kamens, R. M.

A critical review of ambient air aldehyde measurement methods and an analysis of Houston aldehyde data (Part II: An analysis of Houston Aldehyde data and comparison with Cincinnati and St. Paul data). ESC-TR-79-22 66 p.

ABSTRACT: This is the second part of the study cited in the previous record (ID 100120, CH47), the purpose of which was to examine Houston aldehyde data for 1973, 1974 and 1975 and compare the data with that from Cincinnati and St. Paul, Minnesota.

192. Jennings, W. G., Filsoof, M.

Comparison of sample preparation techniques for gas chromatographic analysis.

J. AGRIC. FOOD CHEM. 25(3): 440-445., 05/--/77.

ABSTRACT: The methods used to isolate trace volatiles for gas chromatographic analysis can exercise profound effects on the resultant chromatogram. The chromatogram cannot exhibit high resolution unless the injected sample occupies the shortest possible segment of the column, so that each chromatographing solute band can continue to maintain a maximum concentration while occupying a minimum length of the column, limited only by the column efficiency. This restricted amount of sample must still contain enough of each component of interest to activate the detector. The pretreatment and preconcentration procedures used to achieve these ends usually cause qualitative and quantitative changes in the sample. A model system, whose constituents covered a range of volatilities and functional groups, was examined neat and in dilute aqueous solution by a variety of sampling techniques. Wall-coated open tubular (WCOT) glass capillary columns, achieving baseline separation of all components, permitted realistic comparisons of the different isolation and concentration procedures. Results indicated that no single sampling procedure is uniformly satisfactory, but that depending on the sample composition and the compounds of interest, one or another procedure may be superior. A number of samples, including fruit and meat products, were then subjected to selected sampling techniques, and examined on WCOT glass capillary systems.

193. Johanson, C. J., Moran, J. C., Paine, S. C., Anderson, H. W., Breyse, P. A.

Abatement of toxic levels of carbon monoxide in Seattle ice skating rinks.

AM. J. PUBLIC HEALTH 65(10): 1087-1090, 1975.

ABSTRACT: This paper describes the efforts to overcome excessive levels of carbon monoxide that were found in ice skating arenas where ice-resurfacing machines were used. Carbon monoxide levels as high as 304 ppm were found in an ice arena where a large resurfacing machine powered by a propane fueled engine was operated in an inadequately ventilated space. A survey of other skating rinks in the area was conducted. Efforts were made to educate management personnel of these arenas about the hazards of carbon monoxide.

194. Johansson, I.

Determination of organic compounds in indoor air with potential reference to air quality.
ATMOS. ENVIRON. 12(6/7): 1371-1377, 1978.

ABSTRACT: Concentrations of 15 volatile organic compounds have been investigated in the air of two schoolrooms. The chemical analysis included enrichment on porous polymer beads, heat desorption and gas chromatographic separation on a capillary column connected to either a flame ionization detector or a mass spectrometer. Samples were collected from the indoor air both in the presence and in the absence of the pupils (boys and girls, age 16-19) as well as from the ambient outdoor air. The qualitative composition of indoor and outdoor air was found to be about the same: aliphatic and aromatic hydrocarbons predominate, though indoors the number of compounds detected is larger and the concentrations are higher. Both the number and the concentration increase in the presence of humans. The mean concentrations of acetone and the sum of the concentrations of C2-alkylbenzenes were 7.7 and 8.2 micrograms per cubic meter, respectively in an unoccupied room and increased to 19.8 and 12.1 micrograms per cubic meter, respectively in an occupied room.

195. Johnson, C. B., Pearson, A. M., Dusan, L., Jr.
Gas chromatographic analysis of the dimethylhydrazones of long chain aldehydes.
LIPIDS 5(12): 958-963, 1970.
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196. Johnson, C. J., Moran, J. C., Pekich, R.
Carbon monoxide in school buses.
AM. J. PUBLIC HEALTH 65(12): 1327-1329, 1975.

ABSTRACT: An incident of carbon monoxide poisoning in a Seattle school bus is reported in this study. An investigation was ordered following the hospitalization of eight school children suffering with CO poisoning symptoms--drowsiness, headaches and nausea. A mean value of 15 ppm of CO was found in five buses operated by the school. The procedure selected for the evaluation was to test a large number of buses at a nearby ski resort. Over 200 buses arrived in the ski parking area. During lunch hour, the buses sat idling in the lot when students returned for lunch and rest. Two buses were found to have nearly three times the concentration of CO allowed by EPA for a 1-hour exposure. Altogether, 36 percent of the buses had levels of CO in excess of EPA standards for an 8-hour exposure. As a result of this study, a series of recommendations was offered to reduce the hazard of exposure to CO in school buses.

197. Johnson, D. C., Hammond, E. G.
Sensitive method for the determination of carbonyl compounds.
J. AMER. OIL CHEM. SOC. 48(11): 653-656, 1971.
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198. Jonassen, N.
Exhalation of radon-222 from building materials.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: Many building materials contain small amounts of the radioactive element radium. The radioactive gas radon is formed by decay of radium, which might diffuse out of the material and thus be found in the ambient air. When radon and especially its short-lived daughter products are inhaled, radiational damage of the lung tissue might result. Some results of field measurements of radon levels in apartments and houses are reported and it is shown that summer measurements with high natural ventilation rates are generally lower than winter measurements. The exhalation of radon from building materials can be studied by placing samples in closed vessels and following the growth of activity in the vessels. It is shown that a ventilation rate of one air exchange per hour will lower the theoretical maximum level of 0.8 percent of the unventilated maximum value.

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199. Jones, L. A., Monroe, R. J.
Flash exchange method for quantitative gas chromatographic analysis of aliphatic carbonyls from their 2,4-dinitrophenylhydrazones.
ANAL. CHEM. 37(7): 935-938, 1965.
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200. Jones, R. D., Commins, B. T., Cernik, A. A.
Blood lead levels in London taxi drivers.
LANCET 2: 881, 1972.
ABSTRACT: Findings concerning the blood lead levels in London taxi drivers are reported in this commentary. Although no definite conclusions were reached, a 24-hour average respiratory exposure of 6.1 grams of Pb/cubic meter air for London taxi drivers was predicted. Measurements of airborne particulate lead in busy London streets range from 2.5-6.1 micrograms/cubic meter; whereas in London residential areas, the Pb concentrations are considerably lower—0.4-1.3 micrograms/cubic meter. Because of such differences the exposure to lead for taxi drivers can be assumed to be lower when drivers are off duty.
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201. Jones, R. M., Fagan, R.
Application of mathematical model for the buildup of carbon monoxide from cigarette smoking in rooms and houses. 49-53, 08/--/74.
ABSTRACT: This study uses Turk's equation to obtain curves of concentration vs. time in a room in an office building and in a single family dwelling. Results were compared with similar studies and with current threshold limit values and ambient air quality standards for carbon monoxide (CO). The model was found valid for carbon monoxide and probably valid for other gaseous contaminants not affected by absorption or deposition. Some conclusions were drawn as to minimum ventilation rates for maintaining safe CO levels in the situations studied.
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202. Jonsson, A., Qvarfort, I., Sillen, L. G.
Electrometric investigation of equilibria between mercury and halogen ions, III: The "millimolar" potentials of mercury and the solubility product of mercury (I) chloride.
ACTA CHEM. SCAND. 1: 461-472, 1947.
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203. Joselow, M. M.
Indoor air pollution by mercury.
ANN. INTERN. MED. 78(3): 449, 1973.
ABSTRACT: Concern with house paints that incorporate organic mercury compounds as being logical sources of contamination in the indoor environment is voiced in this editorial note. Measurements of mercury vapor concentrations in homes, offices, and laboratories have been observed in cases to be 1,000 times higher than natural ambient background levels. Although indoor levels found were generally below those considered sufficient to cause clinical symptoms, domestic air pollution by mercury should not be taken lightly.
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204. Joshi, S. B.
Houston field study (1978): Formaldehyde and total aldehydes monitoring program. ESC-TR-79-22 11 p.
ABSTRACT: In the early sixties Altshuller et al. developed a method for the determination of formaldehyde in gas mixtures employing chromotropic acid. Later they

successfully used the method to monitor formaldehyde in the ambient air surrounding Los Angeles. Formaldehyde and total aldehydes were monitored in Houston, Texas during the period September 15 to October 12, 1978. Four City of Houston air monitoring trailers were used as sampling sites for the study. Chromotropic acid in sulfuric acid (CA) was employed in monitoring formaldehyde, and total aldehydes were monitored by the 3-methyl-2-benzothiazolone-hydrazone-hydrochloride (MBTH) method. Additional laboratory measurements analyzing various parameters were also accomplished using these methods.

205. Kadaba, P. K., Bhasat, P. K., Goldberger, G. N.

Application of microwave spectroscopy for simultaneous detection of toxic constituents in tobacco smoke.

BULL. ENVIRON. CONTAM. TOXICOL. 19(1): 104-112, 1978.

206. Kaiser, R. E.

Enriching volatile compounds by a temperature gradient tube.

ANAL. CHEM. 45(6): 965-967, 05/—/73.

ABSTRACT: A powerful procedure for enriching volatile compounds from gases is given by using a temperature gradient along a sorbing bed. This leads to a concentration-focusing effect, as the migration speed of substances through the sorbing material depends exponentially upon the temperature. The focusing effect is superposed by a collection at different places within the sorbing bed for each compound—a so-called locally separated collection, thus preventing chemical reaction of the enriched traces with each other.

207. Kallio, H., Linko, R. R., Kaitaranta, J.

Gas-liquid chromatographic analysis of 2,4-dinitrophenylhydrazones of carbonyl compounds.

J. CHROMATOGR. 65(2): 355-360, 1972.

208. Kamens, R. M., Jeffries, H. E.

A critical review of ambient air aldehyde measurement methods and an analysis of Houston aldehyde data (Part I: Review of measurement methods). 26 p.

ABSTRACT: The purpose of this study was two fold: 1) to examine Houston aldehyde data for the years 1973, 1974, and 1975, both spatially and temporally, for trends, and unusual characteristics, and 2) to compare the characteristics of Houston aldehyde data with that from other cities. The cities for which data were available were Cincinnati and surrounding towns, and St. Paul, Minnesota city stations.

209. Karasek, F. W., Denney, D. W., Chan, K. W., Clement, R. E.

Analysis of complex organic mixtures on airborne particulate matter.

ANAL. CHEM. 50(1): 82-87., 01/—/78.

ABSTRACT: Organic compounds adsorbed on airborne particulate matter are recovered from one half of a 24-h Hi-Vol filter sample by a 2-h soxhlet extraction using methanol. The extract is concentrated for direct GC analysis using a high performance packed column and a digital chromatograph. Qualitative information is obtained from calculated Kovat's retention indices, the identities of which are confirmed by GC/MS/computer techniques. Quantitative information is obtained from response-factored integrated GC peak areas. A series of 50 comparative survey analyses from a single site can be achieved in less than 8 h per sample.

210. Katz, M. (ed.)

Chapter 117: Tentative method of analysis for formaldehyde content of the atmosphere

211. Katz, M., (ed.)

Methods of air sampling and analysis. 2nd ed. 480 P., 1977.

212. Keller, M. D., Lanese, R. R.

A study of reported respiratory illnesses in households cooking with gas or electricity. Paper No. 75-09.5, 1975.

ABSTRACT: The information presented in this paper is directed to individuals in the fields of environmental health, preventive medicine, and public health who are concerned with the health effects of cooking with gas or electricity. An earlier study examined the incidence of reported respiratory illness in members of households cooking with gas or electricity. The present investigation extends that study in order to confirm and validate the reports of illness, and to determine the frequency distribution of 15 reported symptoms among parents and children in the two settings. One hundred twenty households with school-age children were selected from the gas and electric cohorts. Reports of respiratory illness and symptoms were obtained by a nurse-epidemiologist via telephone interviews every 2 weeks for a period of 1 year. When the onset of respiratory illness occurred within 3 days of the nurse's call, a household visit was arranged to examine the person reported ill and to obtain a throat culture. These data not only confirm but replicate the results of the earlier health survey--that cooking with gas or electricity resulted in no differences in incidence of respiratory illness among household members.

213. Kelley, J. S., Sophocleus, G. J.

Retinal hemorrhages in subacute carbon monoxide poisoning: Exposures in homes with blocked furnace flues.

J. AM. MED. ASSOC. 239(15): 1515-1517, 1978.

ABSTRACT: This report emphasizes a specific type of exposure to carbon monoxide (CO) termed "subacute carbon monoxide poisoning," which may occur in homes with improper ventilation of heating units. One of the main reasons for interest in this area is that this form of CO poisoning is difficult to diagnose because the symptoms of nausea, headache, and dizziness resemble other flu-like illnesses. As a result, correct diagnoses are often not made as promptly as they might have been. Hemorrhages were found in the nerve fiber layer of the retina in all five patients who had been exposed to increased levels of CO for more than 12 hours. The authors therefore stress the finding of retinal hemorrhages as a signal for further investigation of the patient's symptoms. Prompt recognition of the cause of the disorder in the home can prevent a tragic outcome.

214. Kerfoot, E. J., Mooney, T. F., Jr.

Formaldehyde and paraformaldehyde study in funeral homes.

AM. IND. HYG. ASSOC. J. 36(7): 533-537, 1975.

ABSTRACT: Formaldehyde is a toxic gas and is classed as an upper respiratory irritant. This study was undertaken to determine the effects on workers exposed to formaldehyde in the form of formalin. Since formalin is used in the process of embalming, six funeral homes were chosen to be studied. Not only were formaldehyde levels determined, but also the control procedures (ventilation systems) were examined. The results showed that formaldehyde is an irritant at levels below the TLV of 2 ppm and that the control methods were not adequate in some cases.

215. Kerr, G. D.

Measurement of radon progeny concentrations in air by alpha-particle spectrometry. ORNL-TM-4924, 1975.

ABSTRACT: A technique is presented for measuring air concentrations of the short-lived progeny of radon-222 by the use of alpha-particle spectrometry. In this technique, the concentrations of RaA, RaB, and RaC are calculated from one integral count of the RaA and two integral counts of the RaC' alpha-particle activity collected on a filter with an air sampling device. The influence of air sampling and counting intervals of time on the accuracy of the calculated concentrations is discussed in the report. A computer program written in the BASIC language is presented for use with this technique. The program calculates the air concentrations of RaA, RaB, and RaC, and estimates the accuracy of these calculated concentrations.

216. Knarr, R., Rappaport, S. M.

Determination of methanethiol at parts-per-million air concentrations by gas chromatography.

ANAL. CHEM. 52: 733-736, 1980.

ABSTRACT: A method is described for determining the air concentration of methanethiol. The sampling device, a 37-mm glass fiber filter impregnated with mercuric acetate, is suitable for either personal or area monitoring. Methanethiol is regenerated from the mercury mercaptide, formed on the filter during sampling, by treatment with hydrochloric acid and is dissolved in methylene chloride. Quantitation employs gas chromatography with flame photometric detection. The detection limit of 17 micrograms/square meter permits use of the method for determining either time-weighted average concentrations or 15-min ceiling concentrations. The relative error of the method is less than or equal to 10%, while the relative standard deviation is less than or equal to 1%.

217. Kolb, B., Auer, M., Pospisil, P.

Ionization detector for gas chromatography with switchable selectivity for carbon, nitrogen, and phosphorus.

J. CHROMATOGR. 134: 65-71, 1977.

ABSTRACT: An ionization detector for gas chromatography is described, the selectivity of which can be changed such that it can be changed such that it can be operated as a universal detector with the same properties as a flame-ionization detector, as a specific phosphorous detector and as a selective detector for both nitrogen and phosphorous. The last operational mode is also used for operation as a selective nitrogen detector. The changeover between all three operational modes is rapid and needs no manipulation of the detector itself, as all necessary operations are effected at the control unit only.

218. Korolczuk, J., Daniewski, M., Mielniczuk, Z.

Gas-chromatographic determination of carbonyl compounds as their phenylhydrazones.

J. CHROMATOGR. 88(1): 177-182, 1974.

219. Kravchenko, T. I., Stankevich, K. I., Malysina, Y. F., Zakhorova, T. G.

Formaldehyde migration from wood sheets in an experiment.

GIG. SANIT. 39(5): 19-22, 05/—/74.

ABSTRACT: The authors investigate the emission of formaldehyde from sheets made of sawdust and wood shavings manufactured by various enterprises. The finding is that the extent of formaldehyde emission is directly proportional to air temperature and its saturation and is inversely proportional to the rate of air exchange and the time of the sheet production. More formaldehyde is emitted from the sheets made of sawdust than from those made of wood shavings.

220. Kravchenko, T. I., Kharchenko, T. F.

Hygienic evaluation and regulation of the use of phenol-formaldehyde glass-reinforced

plastic in the construction of poultry and stock farm buildings.

GIG. SANIT. 41(8): 94-96, 08/--/76.

ABSTRACT: Formaldehyde off-gassing from glass reinforced plastic was found to be so minimal as to present no health hazard.

221. Krus, E. L. R., Hirt, W. E.

Interference of nitrate in the determination of formaldehyde by the chromotropic acid method.

ANAL. CHEM. 49(12): 1865-1867, 10/--/77.

222. Kurylko, L.

Emission of air pollutants from home heating units. Paper No. 77-24.5, 1977.

ABSTRACT: This paper reports on a study conducted at Stevens Institute of Technology in Hoboken, New Jersey, that determined the pollutant emissions and energy utilization efficiencies of home heating units. Included was the determination of emissions of major air pollutants from boilers and furnaces under laboratory conditions in the field. Ten modern oil-fired burners were tested under laboratory conditions; lowest emissions levels were encountered with units having delayed fuel oil valve opening and post firing air purge of the burner. In the field, burners were found to be the most crucial variable in determining the degree of pollutant emissions. The results of the tests reported here are similar to the results obtained by the Battelle Field Survey. In general, though, these tests showed lower smoke, lower CO, lower hydrocarbon, and higher NOx emissions.

223. Kusuda, T.

Control of ventilation to conserve energy while maintaining acceptable indoor air quality.

ASHRAE TRANS. 82: 1169-1181, 1976.

ABSTRACT: The feasibility of intermittent operation of mechanical ventilation systems was examined in this paper. Ventilation, in the context here, is defined as a process of diluting the building air contaminants by bringing in less polluted outdoor air through the building envelope. Theoretical equations were developed for estimating CO2 levels during the intermittent operation of mechanical ventilation systems. Although intermittent ventilation of the type discussed in this paper could be used to save substantial amounts of energy, implementation of the concept would require reliable contaminant control devices. Note that, although this paper focuses on CO2, the method used is applicable to other pollutants.

224. Lahmann, E., Jander, K.

Formaldehyde determination in urban atmosphere.

GESUND.-ING. 89(1): 18-21, 1968.

ABSTRACT: HCHO in the 2-50 gammas/meter cubed concentration range is absorbed to greater than or equal to 98% in distd. H2O when drawn at 150 liters/hr. through a porous glass bottom washing flask. To each ml. of this solution, 0.1 ml. 0.05 molar Na tetrachloromercurate (I) containing 0.1 mg. Na2SO3 and 0.1 ml. solution containing 0.16 mg. pararosaniline and 10 mg. HCl are added. Spectrophotometric evaluation was made after 1.5 hours at 20 degrees, as the color change is at its slowest. HCHO, 0.3 gamma can be detected in 25 ml. solution or 2 gammas/meter cubed in the air by one-hour sampling. The standard deviation was from 3-50 gammas/meter cubed at a concentration of approximately 4.5% HCHO. The determination can be made in the presence of AcH, Me2CO, EtOH, nitrite, sulfide, and sulfite. (Chem Abstracts)

225. Lande, S. S.

Measurement of atmospheric vinyl chloride.

ABSTRACT: Methods for atmospheric vinyl chloride measurement have been reviewed. The lowest detection limits and most specific measurement are achieved by scrubbing atmospheric samples with activated charcoal, desorbing the vinyl chloride, and assaying it by gas chromatography (GC). NIOSH currently recommends collecting samples using tubes packed with 150 mg of coconut shell charcoal, desorbing with carbon disulfide, and analyzing by GC equipped with flame-ionization detection (FID). The method is capable of detecting less than 1 ppm vinyl chloride and has an apparent recovery of about 90%. With thermal desorption techniques, the detection limit can be reduced to the ppb level with no loss of accuracy or precision. Some field methods, such as infrared analysis and conductivity measurement, are capable of detecting 1 ppm or lower but are subject to interferences by other contaminants. They could be useful for evaluating sources of vinyl chloride leaks and for continuous monitoring. Permeation tubes are superior to gravimetric or volumetric methods for generating atmospheres of known vinyl chloride concentration.

226. Laramy, R. E.

Analytical chemistry of vinyl chloride: A survey.

AM. LAB. 9(13): 17-27, 12/--/77.

227. Lave, L. B., Seskin, E. P.

Air pollution, climate and home heating: Their effects on U.S. mortality rates.

AM. J. PUBLIC HEALTH 62(7): 909-916, 1972.

ABSTRACT: The objective of this paper was to obtain information on the health effects of air pollution so as to explain the differences in the mortality rates of various United States cities. The aim of this work is the estimation of the benefits of pollution abatement. The literature relating adverse health effects to either heater or home heating equipment is not developed sufficiently well to suggest physiological mechanisms associating them to chronic disease. In the present analysis, heating variables were studied in order to investigate the importance of the indoor environment on mortality and to examine the interactions of the heating variables with pollution variables. It was the desire of the authors to determine whether these variables would cause the estimated effect of air pollution to fall and become statistically significant.

228. LaVerne, A. A., DiMaio, D. J., Fernandez, A. J.

Occupational, accidental, explorational carbon dioxide inhalation poisonings, and prevention.

PHYSICIAN'S DRUG MANUAL 4, 5(1-8): 83-98, 1973.

ABSTRACT: In a submarine environment, personnel who had been exposed to CO₂ levels reaching 3-15 percent in the air for several weeks developed chronic fatigue and nonspecific pathological reversible syndromes. With the information available at the time of this paper, it appeared that CO₂ inhalation, whether therapeutic or not, can be as safe or as dangerous as the conditions present in each situation. Knowledge of control and prevention of side effects in the therapeutic area of CO₂ research can be applied to the occupational fields of endeavor such as submarine and space exploration.

229. Lawther, P. J., Commins, B. T., Waller, R. E.

A study of the concentrations of polycyclic aromatic hydrocarbons in gas works retort houses.

BR. J. IND. MED. 22: 13-20, 1965.

ABSTRACT: This study was undertaken to assess the probable exposure to polycyclic aromatic hydrocarbons of men who had worked in retort houses any time prior to 1961. Measurements of 3,4 benzo-a-pyrene (BaP) and other polycyclic aromatic hydrocarbons were made in several types of gas works retort houses. Although the tarry fumes which escaped from the retorts contained high concentrations of polycyclic hydrocarbons, in general

workers were exposed to them only briefly. A mean concentration of 3.0 micrograms/cubic meter of benzo-a-pyrene was determined from long-period samples at representative work sites. This level was 100 times that of ambient air in London.

230. Lauther, P. J., Commins, B. T.

Cigarette smoking and exposure to carbon monoxide.

ANN. N.Y. ACAD. SCI. 174: 135, 1970.

ABSTRACT: In this essay, a brief account of the authors' attempts to assess the relative contributions to carbon monoxide (CO) made by ambient air pollution and cigarette smoking is presented. Levels of carboxyhemoglobin in the blood were examined and compared with the expected levels. In addition, the rate of desaturation following experimental gassing was noted. CO measurements were taken in polluted work places along with the blood level measurements of persons working therein. The authors found that smoking outweighs the contribution made by traffic. In smoking experiments performed on the CO content of air on a 15 cubic meter exposure chamber, CO rose to almost 20 ppm following the smoking of 7 cigarettes in 1 hour. Particulate matter measured 3 milligrams/cubic meter during the same time period.

231. Leach, P. W., Leng, L. J., Bellar, T. A., Sigsby, J. E., Jr., Altshuler, A. P.

Effect of hydrocarbons to oxides of nitrogen ratios on irradiated auto exhaust. II.

J. AIR POLLUT. CONTROL ASSOC. 14(5): 176-183, 1964.

232. Leary, J. S., Keane, W. T., Fontenot, C., Feichtmeir, E. F., Schultz, D., Koos, B. A., Hirsh, L., Lavor, E. M., Roan, C. C., Hine, C. H.

Safety evaluation in the home of polyvinyl chloride resin strip containing dichlorous (DDVP).

ARCH. ENVIRON. HEALTH 29: 308-314, 1974.

ABSTRACT: A series of three-home studies involving 26 Arizona families were conducted over a 2-year period to evaluate the safety of the dichlorous (DDVP)-containing insecticide strip. The objective of these studies was to determine whether or not exposure of humans to DDVP strips continuously for a year would affect health. Physical examination, hematologic and clinical chemistry measurements, blood cholinesterase assays, and analysis of air and food for DDVP were performed. Exposures were designed to be exaggerated as strips were placed throughout the homes and changed either every third month for a year, or every month for 6 months. In homes containing 8 to 18 strips maximum observed levels of DDVP in air and food averaged 0.13 milligrams/cubic meter (0.12 ppm). Throughout the studies no adverse effects on health were revealed.

233. Ledbury, W., Blair, E. W.

The partial formaldehyde vapor pressures of aqueous solutions of formaldehyde. II.

J. CHEM. SOC. 127: 2832-3839, 1925.

234. Lefcoe, N. M., Incelet, I. I.

Particulates in domestic premises, I: Ambient levels and central air filtration.

ARCH. ENVIRON. HEALTH 22: 230-238, 1971.

ABSTRACT: The present study documents the particulate load, in the smaller size ranges, in a modern home equipped with central air filtering under varying occupancy and activity conditions. It also compares the total particulate counts in the same home with and without filtration. The average counts in the 0.3 micron, 0.5 micron, and 1.0 micron ranges were related to the normal household activities of children playing, house cleaning, and smoking. Counts in all ranges differed significantly under minimal activity when the electrostatic filter was turned on compared to when it was off. The count increased

dramatically during cleaning and dusting activities. Smoking a cigar in the residence raised the particle counts up to 100 times the baseline level, and with the filter operating it was 1 to 2 hours before levels returned to the baseline.

235. Lefcoe, N. M., Inculet, I. I.

Particulates in domestic premises, II: Ambient levels and indoor-outdoor relationships.

ARCH. ENVIRON. HEALTH 30: 565-570, 1975.

ABSTRACT: This study, a follow-up to the previous one, sought to quantify over longer periods of time and in several homes, the ambient particulate load within household air, the indoor-outdoor pollution relationships, the day-to-night changes in these relationships, and the acute effects of various household activities. Three indoor environments, two residential and one institutional, were monitored for a 1-year period. Indoor particulate levels decreased at night and under conditions of no household activity. Different time lags between correlating indoor and outdoor particle counts were observed in the different homes. Also, the reduction of indoor levels correlated with the airflow ratio of a precipitator.

236. Leinster, P., Perry, R., Young, R. J.

Ethylene dibromide in urban air.

ATMOS. ENVIRON. 12(12): 2383-2387, 1978.

ABSTRACT: Ethylene dibromide (EDB) has recently been reported by the National Cancer Institute U.S.A., to be a potential carcinogen. Its commercial use is predominantly as a scavenging agent for lead in petrol. A procedure has been developed for the rapid sampling of ethylene dibromide in ambient air followed by analysis using gas chromatography with an electron capture detector. Ambient levels in London air were found to be in the range 0.001 - 0.17 micrograms per cubic meter and on a garage forecourt levels of 1.2 and 1.8 micrograms per cubic meter were determined. Ethylene dibromide was also measured in car exhaust and a calculation is included relating levels of organic lead to those of ethylene dibromide.

237. Lehardt, J. O., Bulkin, B. J.

On-the-fly gas chromatography-infrared spectrometry using a cholesteric liquid crystal-effluent interface.

ANAL. CHEM. 45(4): 706-710, 04/1973.

ABSTRACT: On-the-fly infrared spectra of organic vapors in quantities as small as 50 micrograms have been obtained using a cholesteric liquid crystal-effluent interface. The liquid crystal fractionates sample from carrier gas. The technique yields spectra which are solution rather than gas phase spectra, eliminating problems of rotational structure and vapor-liquid frequency shifts. The system can also be used for on-the-fly spectra of organic vapors in an air stream, with comparable efficiency. A technique for extending the system to accommodate higher boiling materials is described.

238. Levaggi, D. A., Feldstein, M.

Collection and analysis of low-molecular-weight carbonyl compounds from source effluents.

J. AIR POLLUT. CONTROL ASSOC. 19(1): 43-45, 1969.

239. Levaggi, D. A., Feldstein, M.

Determination of formaldehyde, acrolein, and low-molecular-weight aldehydes in industrial emissions on a single collection sample.

J. AIR POLLUT. CONTROL ASSOC. 20(5): 312-313, 1970.

240. Lidwell, O. M.

Ventilation, air-movement and the spread of bacteria in buildings.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: Wind pressures, thermal differences, and mechanical ventilation, together with internal activities, generate considerable movements of air within buildings. Microorganisms dispersed into the air are carried by these currents in and out of the building and between the various parts of it. When carried on small particles, as are some spores, the extent of transfer of the biological material does not differ from the air transfer. Bacteria carried on larger particles, however, settle under gravity and the transfer of such organisms is much less than the air transfer. Highly sensitive and selective methods are available for the study of gas and particulate transfers although these have not, so far, been extensively used. The complexities of the air-movements involved make such studies very laborious. Some approaches have also been made towards mathematical expression of the extent of the transfers to be expected. In the light of the limited data available, the epidemiological significance of the transfers observed, particularly the very small transfers between widely separated rooms in buildings, remains undetermined.

241. Liebich, H., Bertsch, W., Zlatkis, A., Schneider, H. J.

Volatile organic components in the skylab 4 spacecraft atmosphere.

AVIAT., SPACE ENVIRON. MED. 46(8): 1002-1007, 08/--/75.

ABSTRACT: The volatile organic components in the spacecraft cabin atmosphere of Skylab 4 were trapped on a solid adsorbent at various times during the mission. In post-flight analyses, more than 300 compounds in concentrations from less than 1 ppb up to 3000 ppb could be detected by high-resolution gas chromatography. In the samples of the 11th, 47th, and 77th day of the mission, approximately 100 components in the molecular weight range of 58 to 592 were identified by mass spectrometry. Besides components known from other environments, such as alkanes, alkenes, and alkylated aromatic hydrocarbons, components typical for the human metabolism such as ketones and alcohols were found. Other typical components in the spacecraft atmosphere are fluorocarbons (freons) and various silicone compounds, mostly normal and cyclic methylsiloxanes.

242. Lindgren, B., Jonsson, A., Sillen, L. G.

Electrometric investigation of equilibria between mercury and halogen ions, V: Complexes between Hg and Cl.

ACTA CHEM. SCAND. 1: 479-488, 1947.

243. Linko, R. R., Kallio, H., Rainio, K.

Gas-liquid chromatographic analysis of 2,4-dinitrophenylhydrazones of monocarbonyl compounds in carrots using glass capillary columns.

J. CHROMATOGR. 155(1): 191-194, 1978.

244. Linnell, R. H., Scott, W. E.

Diesel exhaust composition and odor studies.

J. AIR POLLUT. CONTROL ASSOC. 12: 510-515, 545, 1962.

245. Linnell, R. H., Scott, W. E.

Diesel exhaust analysis.

246. Lippmann, M.

Generation and decay of indoor air contamination.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: Most human activities, whether individual or collective, contribute to the release of chemical contaminants into the air. Those released into the indoor air may be retained in relatively undiluted forms and may, therefore, have the greatest impact on human exposure. Two examples are discussed, NO₂ from unvented gas flames used for cooking or heating, and cigarette smoke. Some important indoor exposures which are discussed result from releases from building materials or furnishings, such as radon and radon daughters, asbestos, and formaldehyde. Other air contaminants, such as SO₂ and O₃, enter the occupied space from the outside environment through exchange with the outside air. Contaminants in the indoor air are removed at varying rates and have various sinks depending on their physical and chemical properties, the size and properties of the interior surfaces, and the rate of exchange and/or circulation of air. The relatively few data available on indoor contaminant removal are discussed. Better definitions of the extent of indoor air contamination and of the factors affecting source and sink strengths are needed.

247. Locklin, O. W., Barnett, R. E.

Guidelines for residential oil-burner adjustment to minimize pollutant emissions. Paper No. 77-24.3, 1977.

ABSTRACT: In the past, the most important reasons for residential oil burner adjustment have been to ensure reliable operation and to provide efficient fuel utilization. Recently, oil burner adjustments have been shown to minimize air pollution emissions, while still meeting the objectives of reliable and efficient operation. This paper describes the basis for the preparation of "Guidelines for Residential Oil Burner Adjustments" and summarizes the adjustment procedures. These Guidelines also formed the basis for an EPA-prepared pamphlet for the distribution to homeowners who heat with oil, to acquaint them with the advantages of servicing.

248. Lohr, L. J., Warren, R. W.

Gas chromatography of certain oximes.

J. CHROMATOGR. 8: 127-129, 1962.

249. Longley, M. Y.

Contamination in a semiclosed environment: The modern home. 14 p., 1969.

ABSTRACT: This paper reports on a research project involving the use of two highly instrumented occupied test homes to define the problem of indoor air contamination more precisely and to study environmental control systems. The contamination of the indoor environment, greatly aided by our increasing use of a large number of chemical entities, may have physiological effects on its inhabitants. Aerosol products present a particularly perilous situation because of their modes of use and variety of chemical components. The problem is further complicated by the trend in housing design toward energy conserving techniques that limit fresh air ventilation.

250. Longley, M. Y.

Indoor air pollution. 29 p., 1970.

ABSTRACT: This report deals with specific elements of the residential environment which can affect the health, comfort, and performance of humans with respect to indoor air pollution. The atmosphere in the home is becoming increasingly contaminated by a wide

variety of materials. This is due, in part, to the use of an ever-increasing amount of chemicals in our daily lives. The condition of atmospheric contamination is also worsened by the decreased amount of fresh air ventilation and circulation in modern homes. It is necessary to modify currently used systems and develop new environmental control systems that provide the following: more air circulation, more clean fresh air ventilation, and/or more indoor air purification. The need for these changes is growing, and the means for achieving them are available or could readily be developed.

251. Louw, C. W., Richards, J. F., Faure, P.K.

The determination of volatile organic compounds in city air by gas chromatography combined with standard addition, selective subtraction, infrared spectrometry and mass spectrometry.

ATMOS. ENVIRON. 11(8): 703-717, 1977.

ABSTRACT: A versatile method has been developed for the determination of C1 - C13 volatile organic compounds in city air. It relies on relatively simple, yet efficient techniques of sample collection and recovery and involves the use of gas chromatography combined with standard addition, selective subtraction, infrared spectrometry and mass spectrometry. This method was applied to identify about 200 volatile organic compounds occurring in the air of three large South African cities. It could be demonstrated that the majority of these compounds were paraffinic hydrocarbons which are known to be relatively inactive in photochemical reactions. However, a considerable number of olefinic and aromatic hydrocarbons which are known to be the precursors of photochemical smog could also be identified. It is probable that these compounds are present in concentrations which are still too low to produce any significant large scale photochemical reactions. Quantitative determinations showed that the concentration ranges obtained for a number of the C1 - C13 volatile organic compounds are very similar to those reported for cities elsewhere in the world.

252. Lowder, W. M., George, A. C., Gogolak, C. V., Blay, A.

Indoor radon daughter and radiation measurements in East Tennessee and Central Florida. HASL Technical Memorandum No. TM-71-8, 1971.

ABSTRACT: This paper reports on the study of radon daughter and gamma radiation levels within private dwellings and public buildings by the Atomic Energy Commission in 1971. This work represents a preliminary step toward the delineation of problems and the techniques required to quantitatively assess man's indoor radiation environment and the nature and distribution of its sources. Two eastern areas of the United States, Tennessee and Florida, were used in the present survey to study both radon and radiation levels. With respect to the Tennessee survey, outdoor radiation levels minus the cosmic-ray air dose ranged between 3.9 to 7.9 microrads/hour, which can be considered typical. Tennessee indoor measurements were comparable to those outdoors. The range of gamma readings in the Florida survey was different, ranging between 2 and 50 microrads/hour. Indoor levels were comparable to those found in Tennessee. Radon daughter measurements in the two survey areas were quite similar, with almost all values falling in the range of 0.005 to 0.03 WL (working levels).

253. Lum, R. A. M., Graedel, T. E.

Measurements and models of indoor aerosol size spectra.

ATMOS. ENVIRON. 7: 827-842, 1973.

ABSTRACT: Measurements of aerosol quantities and size distributions as a function of time and for suspected sources were obtained from a controlled indoor environment in this study. Variations in the total particle count of as much as a factor of 5 can be directly attributed to personnel shift changes, dry-mopping the floor areas, cigar smoke and chalk dust, and demonstrate the substantial effect of personnel on the aerosol environment of an enclosed area. Significant differences are observed in the characteristics exhibited by controlled and natural aerosols. Indoor measurements indicate approximately $r(E-7)$ dependence of the aerosol size distribution function in contrast with the $r(E-4)$ value typically determined for naturally occurring aerosols, and a consequent sharp decrease in the mass median diameter and in the aerosol volume fraction. The steepening of the aerosol size spectra is a result of both the air recirculation cycles and the filtration systems which are employed. Theoretical models are developed and utilized to study the effects of air treatment systems as a function of particle size. The close agreement obtained between models and measurements is used to derive engineering techniques by which indoor aerosol

254. Lundqvist, G. R.

The effect of smoking on ventilation requirements.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM., 1979.

ABSTRACT: Suspended particulate matter (SPM), carbon monoxide and droplet nuclei have been measured in a climate chamber of 50 cubic meters as indicators of the particulate and gaseous phase of cigarette smoke. Various combinations of smoking intensities and ventilation rates between 1 and 16 air changes per hour were investigated partly by a standardized smoking machine procedure and by individual smoking by a panel of four persons. The panel had at the same time a questionnaire to complete about subjective votes on odor intensities and irritation to the upper airways and eyes caused by the tobacco smoke. The results demonstrate that each characteristic component in the cigarette smoke will follow its own elimination function, dependable on adsorption to surfaces, agglomeration or other interaction processes in the enclosed aerosol. A ventilation rate of 60-80 cubic meters per cigarette smoked seemed to be necessary to eliminate the total aerosol predominantly by ventilation. The results of the subjective voting on eye and nose irritation, odor intensity, and odor pleasantness showed that odor intensity was increasing before irritation, and nose and throat irritation was occurring before eye irritation, but after eye irritation had started, it was given the highest score of irritation degree. A log-log delineation of connection between concentrations of SPM, CO, and condensation nuclei, smoking intensities of 6, 12, and 24 cigarettes per hour and ventilation rates between E-1 and E2 air changes per hour has been made based on extrapolation of experimental data.

255. Lupton, J. M., Lynch, C. C.

Polarographic examination of carbonyl compounds.

J. AM. CHEM. SOC. 66: 697-700, 1944.

256. Lyles, G. R., Dowlins, F. B., Blanchard, V. J.

Quantitative determination of formaldehyde in the parts per hundred million concentration level.

J. AIR POLLUT. CONTROL ASSOC. 15(3): 106-108, 03/--/65.

ABSTRACT: A new method has been developed for the determination of trace quantities of formaldehyde and appears to be superior to existing methods. The procedure is based on a modification of Schiff's test for aldehydes. A mixture of dichlorosulfite-mercurate II complex and acid bleached pararosaniline hydrochloride is used as the reagent. In the presence of formaldehyde, a purple color is produced. The method is highly sensitive to formaldehyde and acetaldehyde, simple and does not require concentrated acids. When applied to air pollution studies, the method is virtually free of interferences from higher aldehydes. The paper describes the application of this method to spot sampling of the atmosphere and to continuous atmospheric analysis.

257. Lyshkow, N. A., McCormack, C. G.

Individual air pollution monitors.

PROCEEDINGS OF THE 4TH JOINT CONFERENCE ON SENSING OF ENVIRONMENTAL POLLUTANTS. 366-369, 1977.

ABSTRACT: An analysis system was developed for field monitoring of certain pollutants. Prototypes were developed specifically for job safety applications. The analysis system lends itself to a wide variety of uses including personal exposure monitoring with or without alarms. The analysis is based on a measurement of reflectance from a silica gel tape using a light emitting diode light source. Due to the wide variety of light emitting diodes available, a wide range of analyses could be implemented on the system using existing technology for silica gel analysis. Much further development,

however, remains. The methodology has been proven to be feasible but improvements in the hardware and a further reduction in size are necessary before commercialization. The electronics of the system could be modified to utilize new micro processors, which were not available at the time of its original design. This would both simplify and greatly reduce the size of the instrument. The analyses are based on known silica gel based analytical procedures and extension of the range of pollutants should not present major difficulties.

258. Macriss, R. A., Elkins, R. H.

Control of the level of NO_x in the indoor environment., 1977.

ABSTRACT: This paper presents the results of a series of in-depth experimental studies to determine the extent to which combustion products from gas-fired unvented home appliances (particularly the range and oven) contribute to the NO_x levels in the home environment. The extent to which such concentration levels are affected by the level of cooking, natural infiltration, forced exfiltration, air conditioning, and other factors is also discussed. A quantitative model which couples emission rates, ventilation rates, and dilution equations, verified by the above experimental results, is presented. Alternative approaches aimed at control of short-term peak concentrations and 24-hour average levels of NO₂ are also discussed; comparison of the effectiveness of the approaches is specifically emphasized.

259. Malysina, Y. F.

The effect of cladding and additional thermal processing on emission of harmful substances from sheets made of wood shavings and manufactured on a base of urea resin.

GIG. SANIT. 39(8): 95-97, 08/--/74.

ABSTRACT: The authors conducted chemical research in order to determine the effect of the quality of coatings and thermal processing on the emission of harmful substances from materials and also to establish the kinetic principles of migration of volatile substances in the air. Sheets made of wood shavings, finished single-ply birch veneer with thickness 1.5 mm were studied with different types of coatings. Using the chromotropic acid measuring technique, the authors found that those sheets coated with parquet varnish emitted formaldehyde at 2-5 levels lower than usual.

260. Manoharan, A., Jacobs, M. B., Goldwater, L. J.

Dust counts in domestic atmospheres. Paper No. 61-85

PROCEEDINGS OF THE 5TH ANNUAL MEETING OF THE AIR POLLUTION CONTROL ASSOCIATION., 1961.

ABSTRACT: A preliminary study evaluating the relative significance of differences in count and particle size of indoor and outdoor air at the same site is reported in this document. The air was sampled at only 30 locations due to time constraints. The count for indoor air ranged from 1.47 to 53.4 MPPCF (millions of particles per cubic foot) and from 2.2 to 53.1 MPPCF in outdoor air. Indoors, 73 percent of the particles were less than 1 micron in diameter; outdoors, only 56 percent were below this size.

261. Mansfield, C. T., Hodge, B. T., Hege, R. B., Jr., Hamlin, W. C.

Analysis of formaldehyde in tobacco smoke by high performance liquid chromatography.

J. CHROMATOGR. SCI. 15(8): 301-302, 1977.

262. Mapes, W. H., Vance, R. F.

Efficiency evaluation of odor control devices. GE Report No. 70-MMAL-12, 1971.

ABSTRACT: The air in interior environments contains odorous gases which arise from certain household activities such as food preparation and smoking. While these gases are more of a nuisance than a health problem, their removal from the interior air is a desirable goal. The use of odor filters on the residential air handling systems was investigated in this study. A system for experimentally determining the odorant adsorption

efficiencies of thin charcoal filters was constructed. Using a mass balance model, the odorant removal efficiency can be calculated.

263. Mari, R., Feve, M., Dzierzynski, M.

Colorimetric reaction between phenylhydrazine, formaldehyde, and oxygen in alkaline solution: Determination of formaldehyde.

BULL. SOC. CHIM. FR. 1395-1399, 1961.

264. Mason, M. E., Johnson, B.

Mass spectral analysis of carbonyls regenerated from their 2,4-dinitrophenylhydrazones: An extension of the procedure of Ralls.

ANAL. CHEM. 37(6): 760-761, 05/--/65.

265. Matsumoto, T.

Concentrations of formaldehyde release from plywood in an environmental test room.

RINGYO SHIKENJO KENKYO HOKOKU. 262: 41-58, 1974.

ABSTRACT: The information presented in this report is a review of the existing literature on formaldehyde (HCHO) release. It also confirms that both temperature and humidity affect the formaldehyde odor level indoors.

266. May, W. E., Chesler, S. N., Cram, S. P., Gump, B. H., Hertz, H. S., Enasonio, D. P., Dyszel, S. M.

Chromatographic analysis of hydrocarbons in marine sediments and seawater.

J. CHROMATOGR. SCI. 13: 535-540, 11/--/75.

ABSTRACT: The low concentration of hydrocarbons anticipated in pollution baseline studies necessitates the development of analytical techniques sensitive at the sub-microgram per kilogram concentration level. The method of analysis developed in this laboratory involves dynamic headspace sampling for volatile hydrocarbon components of the sample, followed by coupled-column liquid chromatography for the non-volatile components. These techniques require minimal sample handling, reducing the risk of sample component loss and/or sample contamination. Volatile sample components are separated from the matrix in a closed system and concentrated on a TENAX-GC packed pre-column, free from large amounts of solvent and ready for GC/GC-MS analysis. Non-volatile compounds, such as the benzopyrenes, may be extracted from large volumes of water and concentrated on a Bondpak C18 packed pre-column for coupled-column liquid chromatographic separation and analysis. Results of the application of these techniques to the analysis of samples from sites of known low level hydrocarbon contamination are presented and discussed.

267. Mayron, L. W., Winterhalter, J. J.

Carbon monoxide: A danger to the driver?

J. AIR POLLUT. CONTROL ASSOC. 26(11): 1085-1088, 1976.

ABSTRACT: The interiors of 51 automobiles were measured for carbon monoxide (CO) in this study performed in Skokie, Illinois. A portable analyzer 2600 was used to measure CO levels inside an idling car in the area of the driver's seat, in ventilating air entering the automobile, and in the ambient air at busy traffic positions and intersections. Concentrations of CO were observed from 1.5 to 100+ ppm. Eleven cars exceeded the 8-hour CO standard of 9 ppm; however, the impact of these concentrations would depend upon how much time each driver spends in his/her car. A prime factor that appears to result in higher levels of CO is traffic delays, except in instances when an exhaust leak is present. The possibility of CO exposure as a cause of accidents is also discussed.

268. McCown, S. M., Earnest, C. M.

Gas chromatographic detectors: A syllabus of errors.

AM. LAB. 10(5): 33-40., 05/--/78.

ABSTRACT: Gas chromatography is used extensively as an analytical tool in many professional disciplines. Scientists using gas chromatography include biologists, pharmacists, engineers, environmental and forensic scientists, and chemists. Many users have little or no training in gas chromatographic instrumentation prior to their initial experience with the technique. The 'hands-on' training of the inexperienced operator can be expensive not only from the standpoint of acquiring erroneous data but also from damage to the instrument. This is not to say there is no place for hands-on training, but rather that such training should come only after adequate instruction. It is also true that all gas chromatographers experience hands-on training for several years after their initial practical experience, regardless of the level of prior training. It is the purpose of this paper to discuss some of the common errors that the authors have encountered either firsthand or of which they are aware. This discussion is limited to the three most commonly used detectors in gas chromatography: the thermal conductivity detector, the flame ionization detector, and the electron capture detector.

269. McFadden, J. E., Beard, J. H., Moschandreas, D. J.

Survey of indoor air quality health criteria and standards. GEOMET Report No. EF-595, 1977.

ABSTRACT: This report is the result of a study undertaken to survey existing air quality standards for the U.S. Department of Housing and Urban Development and the Environmental Protection Agency. Indoor air quality standards may be classified into three stages: (1) maximum allowable air quality standards, (2) design-level standards and (3) emissions standards. Each type may be a guideline, rule, regulation or standard. The purpose of all three types is to safeguard the health, safety and well-being of inhabitants within the indoor environment. A major conclusion reached by the authors of this document is that there has been no scientific effort to establish air pollution standards specifically for the residential environment.

270. McLean, J. D., Holland, J. F.

Development of a portable polarograph for determination of aldehydes in automotive exhaust and production plant samples.

ENVIRON. SCI. TECHNOL. 9(2): 127-131, 02/--/75.

271. McNall, P. E.

Reduction of tobacco smoke contaminants in interior spaces by means of filtration.

SCAND. J. RESPIR. DIS. 91: 36-43, 1974.

ABSTRACT: Standard methods have been developed for rating the performance of filters. In this paper these methods are discussed in relation to tobacco smoke. The two standard methods--the weight procedure and atmospheric dust spot efficiency method--are described. Using filter efficiencies and other basic data, predictions of the contamination levels in various spaces due to tobacco smoking at various rates can be made.

272. McNall, P. E.

Practical methods of reducing airborne contaminants in interior spaces.

ARCH. ENVIRON. HEALTH 30: 552-556, 1975.

ABSTRACT: Indoor air can be contaminated by processes operating within the space, or contaminants can be present in the surrounding air and thus enter the building through infiltration and ventilation. This paper discusses the engineering aspects of contamination control. It states that filters and the ventilation system offer the most practical technology for indoor pollution control. However, it is difficult and expensive to control inside environmental contaminant levels at values less than 20 to 25 percent of

those occurring outside. Validation of the theoretical equations used to predict inside contaminant concentrations was achieved by conducting field tests using tobacco smoke as the pollutant.

273. McReynolds, W. O.

Characterization of some liquid phases.

J. CHROMATOGR. SCI. 8: 685-691, 12/--/70.

274. Meadows, G. W.

Evaluation of Tedlar bag sampling procedure for measurement of airborne formaldehyde. ICD-ES-77-31 51 p., 01/16/78.

ABSTRACT: It was shown that in order to measure formaldehyde in the atmosphere by first collecting a sample in a Tedlar plastic bag the sample must be removed from the bag within a few hours and the formaldehyde recovered for analysis. The loss of formaldehyde when a sample is stored in a Tedlar bag for more than a few hours results in low and somewhat erratic results. In view of the reactive character of formaldehyde the use of a plastic container introduces a source of analytical error which is not a factor when formaldehyde is collected by passing the atmospheric sample directly through a formaldehyde absorption train. The small sample volume, unless very unwieldy bags are used, is also a limitation on the accurate measurement of low levels of formaldehyde in air.

275. Mesaw, W. J.

The penetration of iodine into buildings.

INT. J. AIR WATER POLLUT. 6: 121-128, 1962.

ABSTRACT: In October 1957 about 20,000 curies of iodine-131 were released into the atmosphere in Windscale. This incident provided the author of this paper with the opportunity to test the theory that for a constant ventilation rate, and in the absence of deposition, the time integral of iodine concentration inside a building will be exactly the same as outside. Field measurements and experiments on the penetration of iodine and Aitken nuclei into buildings were carried out. The purpose of this work was to determine the extent of penetration of radioactive material into buildings. The building used for tests was a 20 x 9 x 7 foot high wooden hut with reasonably fitting doors and windows. It was observed that the concentrations of nuclei inside the hut varied with conditions from 30 to 80 percent of that outside.

276. Melfi, S. H., Lawrence, J. D., Jr., McCormick, M. D.

Observation of Raman scattering by water vapor in the atmosphere.

APPL. PHYS. LETT. 15(9): 295-297, 11/01/69.

ABSTRACT: Raman backscatter of a frequency-doubled ruby laser beam by water vapor has been observed in the atmosphere, using an optical radar system. This return along with a Raman nitrogen return, has been used to calculate a relative water-vapor mixing ratio profile in the atmosphere to an altitude of approximately 2 kilometers.

277. Melia, R. J. W., Florey, C. du V., Altman, D. G., Swan, A. V.

Association between gas cooking and respiratory diseases in children.

BRI. MED J. 2: 148-152, 1977.

ABSTRACT: A 4-year longitudinal study of the prevalence of respiratory symptoms in schoolchildren and related environmental and socioeconomic factors is in progress. Results for the first year of this study (1973) are reported. A total of 5758 children aged 6 to 11 years from 28 randomly selected areas of England and Scotland was examined. In an analysis of the effects on health of possible indoor pollutants, boys and girls from homes in which gas was used for cooking were found to have more coughs, "colds going to the

chest," and bronchitis than children from homes where electricity was used. The girls also had more wheeze if their families used gas for cooking. This "cooking effect" appeared to be independent of the effects of age, social class, latitude, population density, family size, overcrowding, outdoor levels of smoke and sulfur dioxide and types of fuel used for heating. It was concluded that elevated levels of oxides of nitrogen arising from the combustion of gas might be the cause of the increased respiratory illness.

278. Melia, R. J. W., du V. Florey, C., Darby, S. C., Palmes, E. D., Goldstein, B. D.

Differences in NO₂ levels in kitchens with gas or electric cookers.

ATMOS. ENVIRON., 1978.

ABSTRACT: A designed experiment is described in which the reliability of personal samplers for measuring the concentration of atmospheric nitrogen dioxide (NO₂) was investigated in kitchens. The samplers were placed in triplets, 4 feet (1.2 meters) above floor level, at 2 and 7.5 feet (0.6 and 2.2 meters) from the cookers. Four kitchens were used, two with gas and two with electric cookers. Each gas kitchen was matched with an electric kitchen on a variety of environmental factors which might have affected the concentration of NO₂. Both gas kitchens were using "natural gas." The instruments were found to be highly reliable. The overall average measurement was 40.9 ppb and the S.D. of the measurement error in the instrument was estimated to be 1.2 ppb. The differences in the concentrations at the two distances from the cookers were not consistent. The average hourly concentration of NO₂ in gas kitchens was more than seven times greater than that in electric kitchens (72.3 ppb compared with 9.5 ppb, P is less than 0.05). This result suggests that further research is needed to determine whether the high levels of NO₂ found in gas kitchens have adverse effects on health.

279. Melichar, A.

Literature review of methods for combustion and draft hood spillage control of gas appliances. Research Project DA-8-HA, 1959.

ABSTRACT: The control of buildup of combustion products expressed in terms of CO₂ in rooms with unvented gas heaters requires an adequate air supply on a continuous basis. Equilibrium concentration of CO₂ is equal to approximately 0.10 of the input in Btu per hour. Using a simple exponential equation, it turns out that almost 300 cubic feet per hour of ventilation air are required to just maintain a 3.4 percent CO₂ equilibrium concentration. It is essential to avoid operation of an unvented gas heater system with minimum air supply because this is on the verge of a dangerous condition, will produce excessive condensation and will cause high breathing rates. At a time when builders and engineers are trying to reduce air flow within a residence to meet with this nation's demand towards energy conservation, the undesirable buildup of CO₂ as caused by inadequate fresh air supply should not be overlooked.

280. Michaelsen, G. S.

Ventilation as a means of contamination control in hospitals and laboratories.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM. 225-238, 1979.

281. Mieure, J. P., Dietrich, M. W.

Determination of trace organics in air and water.

J. CHROMATOGR. SCI. 11(11): 559-570, 11/--/73.

ABSTRACT: The authors have developed several procedures for measuring trace organics in air and water matrices. These methods use only the equipment and apparatus normally found in an analytical laboratory, and require a minimum of operator training. The scheme the authors use for analyzing both air and water consists of the following operations: a) the organics are concentrated and isolated from the matrix, b) the components of interest are identified, and c) the identified compounds are measured. The second two operations are based primarily on gas chromatography (GC) and utilize relatively standard techniques. These are basically the same for air and water. However, the concentration and isolation

techniques differ considerably, depending on the matrix. Because of this difference, air and water matrices will be considered separately.

282. Mikhaylova, A. A., Lifshits, Y. I., Ivanova, L. T., Grinberg, F. S., Temkina, R. A., Shvartsman, G. M., Yudina, G. G., Svitkina, M. M.

Improving hygienic properties of wood-shaving sheet.

GIG. SANIT. 39(7): 86-88, 07/—/74.

ABSTRACT: Using a new resin of formaldehyde, the amount of off-gassing was reduced below the standard threshold. The sheets of wood shavings were tested under various conditions of temperature and make-up over month-long periods.

283. Mitchell, R. E., Taylor, B. R., Williams, G. C., Sarofim, A. F.

Control of nitric oxide emissions from gas-range burners. Paper No. 75-09.3, 1975.

ABSTRACT: In order to determine a strategy for the control of emissions from range-top burners, the behavior of well-defined laminar diffusion flames has been studied. Detailed concentration and temperature profiles have shown that nitrogen oxide (NO_x) formation is confined primarily to the fuel-lean side of the flame surface where temperature and oxygen availability are suitable for NO_x production. The Zeldovich mechanism (N₂ + O → NO + N) was found to be the dominant mechanism for NO production in the laminar methane-air diffusion flame investigated; NO formation via CH and NH intermediates was relatively insignificant. The high activation energy associated with the Zeldovich mechanism indicated that NO_x emissions could be reduced by the redistribution of energy within the flame zone. Studies of the effects of changes in burner port size, number, and location on NO_x emissions indicated that only modest reductions in emissions (up to 30 percent) could be achieved by the aerodynamic quenching of the combustion gases. However, by using various configurations and sizes of wire meshes to redistribute energy within the flame, reductions in NO_x emissions up to three-fold with possible potential for greater reduction, could be achieved.

284. Molhave, L.

Indoor air pollution due to building materials 19 p.

ABSTRACT: Measurements were carried out in 14 living or working rooms, from where occupants were complaining over severe non-thermal problems. The study was conducted as pilot measurements of concentrations of organic gases and vapours and concentrations of dust. Air temperature, air humidity and odour strength as perceived by the observer was registered as well. The off-gassing of organic gases and vapours from 32 normal building materials were further measured by headspace analysis under stabilized atmospheric conditions, and concentrations and compounds found are compared to the findings from the 14 field locations.

285. Molhave, L.

Indoor air pollution due to building materials.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM. 89-110, 1979.

286. Molhave, L., Moller, J.

The atmospheric environment in modern Danish dwellings: Measurements in 39 flats.

INDOOR CLIMATE: EFFECTS ON HUMAN COMFORT, PERFORMANCE, AND HEALTH IN RESIDENTIAL, COMMERCIAL, AND LIGHT-INDUSTRY BUILDINGS. PROCEEDINGS OF THE FIRST INTERNATIONAL INDOOR CLIMATE SYMPOSIUM. 171-186, 1979.

287. Morgan, G. B., Golden, C., Tabor, E. C.

New and improved procedures for gas sampling and analysis in the National Air Sampling Network.

TECHNICON SYMPOSIA: AUTOMATION IN ANALYTICAL CHEMISTRY. 1: 526-533, 1966.

ABSTRACT: The National Air Sampling Network has operated a nationwide gas sampling program since 1959. Equipment and supplies are furnished to local participating agencies, who collect the samples and return them to the laboratory of the NASN, to be analyzed for sulfur dioxide and nitrogen dioxide. The compact sampler developed for this purpose has proved reliable and easy to ship, operate, and maintain.

288. Morgan, M. G., Morris, S. C.

Individual air pollution monitors and examination of some nonoccupational research and regulatory uses and needs. Research Paper BNL-50637, 1977.

ABSTRACT: Knowledge of the relationship between ambient air pollution levels measured at fixed monitoring stations and the actual exposure of the population is very limited. Indeed, there is rapidly growing evidence that fixed-station monitors do not provide adequate data for population exposure. This report examines available data for carbon monoxide (CO) and sulfur dioxide (SO₂) and presents a new analysis. Actual population exposure to CO appears to be consistently higher than expected from fixed-station data, while limited evidence suggests that exposures to SO₂ are lower. A reported general relationship between indoor and outdoor levels of SO₂ is not supported by the data. If air pollution represents a threat to public health, then more attention must be given to total population exposure to pollutants. A selective use of individual air pollution monitors that can be worn or carried appears to be required at some stage by any experimental design seeking to uncover the relation between air pollution exposure and health effects. Additionally, potential uses of individual monitoring in air pollution regulation are explored. Current status and research needs for individual air pollution monitors are examined and a first-order evaluation is given of the promise held by the candidate instrumentation technologies. A national program of support for the development of individual air pollution monitors is recommended.

289. Morris, E. D., Jr., Niki, H.

Reactivity of hydroxyl radicals with olefins.

J. PHYS. CHEM. 75(23): 3640-3641, 1971.

290. Morris, E. D., Jr., Niki, H.

Mass spectrometric study of the reaction of hydroxyl radical with formaldehyde.

J. PHYS. CHEM. 55(4): 1991-1992, 08/15/71.

291. Morris, E. D., Jr., Niki, H.

Reaction of the nitrate radical with acetaldehyde and propylene.

J. PHYS. CHEM. 78(13): 1337-1338, 1974.

292. Morrison, R. L., Maddux, A., Hrubesh, L.

A portable microwave spectrometer analyzer for chemical contaminants in air: A feasibility study. Final report. UCRL-51945 21 p., 10/28/75.

ABSTRACT: The Lawrence Livermore Laboratory has completed a feasibility study for the construction of a field-portable microwave spectrometer analyzer for chemical contaminants in air. This study has produced a set of design specifications that will result in an instrument capable of analyzing 10 separate gases at the required NIOSH detection limits. The system will use either a YIG-tuned Gunn-effect oscillator or multiple-varactor-tuned Gunn-effect oscillator, and the required stability will be achieved by a new gas absorption

293. Moschandreas, D. J., Swift, J. L., Ward, J. R., Beard, J. H.

The status of indoor air pollution research. EF-547, 1976.

ABSTRACT: Much research has examined the occurrences of air pollution in outdoor and workplace environment. A smaller, newer body of research has examined air pollution in nonworkplace, indoor environments. A new emphasis on measures to conserve energy in buildings and curb heat loss through reduced indoor-outdoor air exchange has encouraged interest in the relation between indoor and outdoor air quality, building energy conservation, and the potentials for adverse health effects from indoor air pollution in nonworkplace environments. A review of this body of research is the subject of this report. The following topics were considered in this state-of-the-art of indoor air pollution research: 1) Sources of air pollution in dwellings, schools, public buildings and vehicles, 2) Influences of air quality and meteorological conditions on indoor air quality, 3) Usage of products which serve as sources of indoor air pollutants, 4) Technology for monitoring indoor air pollution, 5) Mobility, dispersion characteristics, decay and reactivity of indoor air pollutants, 6) Occupancy by humans of indoor air spaces, 7) Energy conservation measures presently being utilized in nonworkplace buildings, 8) Changes in indoor air quality as a function of energy conservation, 9) Health effects associated with characteristics of indoor air pollutants, including a rank ordering of air pollutants in terms of the hazard to human health resulting from their occurrence in nonworkplace indoor environments.

294. Moschandreas, D. J., Morse, S. S.

Proceedings of the GEOMET Program Review Workshop on Air Pollution, Energy Conservation and Health Effects in the Indoor Residential Environment. GEOMET Report No. E-646, 1977.

ABSTRACT: The presentations and discussions on the workshop program review of the EPA-HUD-GEOMET indoor-outdoor air pollution project held on September 28, 1977 are included in this report. The distinct nature of the residential environment from the ambient outdoor environment was characterized by the data base acquired from the field monitoring program of this project. The GEOMET Indoor-Outdoor Air Pollution Model, formulated from the fundamental principle of the mass balance equation and validated by the monitored data base, was presented. The feasibility of utilizing the data collected and applying the developed GEOMET Indoor-Outdoor Air Pollution Model in future epidemiological studies was examined. Also included in this document are questions and answers by the workshop participants on these three principal aspects of the GEOMET project. The importance of the subject was reemphasized and continuation of relevant research urged.

295. Moschandreas, D. J., Stark, J. W. C.

The GEOMET Indoor-Outdoor Air Pollution Model: Scientific report. GEOMET Report No. EF-628, 1977.

ABSTRACT: This report documents the work done on a numerical model which computes indoor air pollutant concentration levels based on outdoor pollutant concentration levels, internal pollutant source rates, chemical decay rates, and air exchange rates. Topics covered include model formulation and derivation, parameter estimation, statistical model validation, and model sensitivity to perturbations in the model parameters. Pollutants considered are CO, SO₂, NO, NO₂, O₃, CH₄, CO₂, and nonmethane hydrocarbons. It was found that the model could not be validated for SO₂ due to the low levels of the monitored SO₂ concentrations against which concentrations computed by the model were to be compared. In addition, NO₂ concentrations were not modeled acceptably, but corrective measures were taken to remedy this situation. Finally, concentrations of the remaining pollutants were calculated well within acceptable ranges by the model for a variety of conditions.

296. Moschandreas, D. J., Stark, J. W. C., McFadden, J. E., Morse, S. S.

Indoor air pollution in the residential environment, Volumes I & II. GEOMET Report No. EF-688, 1978.

ABSTRACT: A 24-month study was undertaken to characterize the indoor residential air quality. It was determined that the air quality of the residential environment was markedly different from the outdoor ambient air quality. In this study, 17 residential dwellings

were monitored, each for a 14-day period. Air samples were collected from four locations: one outdoor site adjacent to the building and three indoor sites. Information gathered during this program was used in the development of two numerical models. The GEOMET Indoor-Outdoor Air Pollution (GIOAP) model simulates indoor conditions and estimates indoor pollutant concentrations as a function of outdoor levels, air exchange rates, indoor source strengths and pollutant decay rates. The second model, the Steady State TSP model, estimates indoor TSP levels. Also discussed in this report is the relationship between energy conservation measures and air quality in the indoor environment.

297. Moschandreas, D. J.

Indoor air pollution levels as a function of changing ventilation rates.

PROCEEDINGS OF THE VENTILATION VS ENERGY CONSERVATION IN BUILDINGS CONFERENCE., 1978.

ABSTRACT: This paper studies the effects of varying ventilation rates on indoor air pollution levels of nonworkplace buildings. The need to conserve energy resources has resulted in a major effort toward energy conservation measures in the design and use of buildings. This, linked with increasing concern with the impact of air pollution on human health, has brought forth a major issue: the introduction of new energy transfer systems and the reduction of building ventilation rates will result in changes in the indoor air quality of buildings. The effects of varying ventilation in the indoor air pollution levels were examined by simulating a series of pollution events using the GEOMET Indoor-Outdoor Air Pollution Model. It was seen that the effect of changing ventilation rates crucially depends on other factors such as the presence or absence of an indoor pollutant source, the control to decrease pollutant generation rates indoors, and the outdoor pollution levels.

298. Moshier, R. W.

Acrolein determination in the presence of formaldehyde and acetaldehyde by the polarographic method.

IND. ENG. CHEM., ANAL. ED. 15(2): 107-109, 02/15/43.

299. Muchtarova, M., Dimov, N.

Gas Chromatographic identification of some indoor air pollutants using correlation equations.

J. CHROMATOGR. 148: 269-272, 1978.

300. Mueller, F. X., Loeb, L., Mapes, W. H.

Decomposition rates of ozone in living areas.

ENVIRON. SCI. TECHNOL. 7(4): 342-346, 1973.

ABSTRACT: The decomposition rate of ozone has been monitored in several metal test facilities, an office, and a home. Experimental data generated in four test situations indicate that the decomposition of ozone in living areas follows first-order kinetics. The rate of ozone decay was very sensitive to variations in temperature, relative humidity, prior exposure of metal surfaces, and the number of potentially active catalytic surfaces in the room. Decay rates in closed areas can be enhanced by raising the temperatures or increasing relative humidity. Activated carbon was shown to be effective as a decomposition filter for keeping ozone concentrations to acceptable levels in living areas.

301. Murray, K. E.

Concentration of headspace, airborne and aqueous volatiles on Chromosorb 105 for examination by gas chromatography and gas chromatography-mass spectrometry.

J. CHROMATOGR. 135(1): 49-60, 05/11/77.

ABSTRACT: Techniques are described for the collection of volatile material from

headspace vapours and the atmosphere and for the direct extraction of volatiles from aqueous solution by traps containing the porous polymer Chromosorb 105. The traps are inserted through a valve into a gas chromatograph which facilitates the desorption and transfer of the volatiles to high-resolution capillary columns. Selected applications of the technique are described.

302. Nauman, R. V., West, P. W., Tron, F., Gaeke, G. C., Jr.

A spectrophotometric study of the Schiff reaction as applied to the quantitative determination of sulfur dioxide.

ANAL. CHEM. 32(10): 1307-1311, 09/—/60.

303. Nelms, L. H., Reiszner, K. D., West, P. W.

Personal vinyl chloride monitoring device with permeation technique for sampling.

ANAL. CHEM. 49(7): 994-998., 06/—/77.

ABSTRACT: A method for measuring the exposure of personnel to vinyl chloride has been developed which utilizes the permeation technique for sampling. The vinyl chloride that permeates the membrane is trapped on activated charcoal which is removed for subsequent determination by gas chromatography. The monitor is about the size of a standard film badge, weighs less than 35 g, and requires no source of power. The method is insensitive to temperature and humidity, and is free of significant interferences. The method is ideally suited to personal monitoring programs required by OSHA regulations, because the analytical data represent a time-weighted-average exposure and require no further data reduction step.

304. Nicholson, W. J., Rohl, A. N., Weisman, I.

Asbestos contamination of the air in public buildings. EPA Report No. 450/3-76-004, 1975.

ABSTRACT: From 1958-1973 asbestos-containing material was used extensively for fire-proofing high-rise office buildings. Concern that these past uses of asbestos may lead to contamination of the air within these buildings has led to the present study. The air (indoor and outdoor) of 19 buildings in 5 U.S. cities has been analyzed for asbestos. The results of this sampling and analysis demonstrate that significant contamination can occur in the air supply systems of buildings in which fibrous-type dry spray asbestos-containing fireproofing materials were used. No contamination was found where cementitious spray material was used. The contamination demonstrated here was manifested only through analysis procedures using electron microscopy.

305. Novotny, M., McConnell, M. L., Lee, M. L.

Some aspects of high-resolution gas chromatographic analysis of complex volatile samples.

J. AGRIC. FOOD CHEM. 22(5): 765-770, 1974.

ABSTRACT: Volatile samples from food aroma, odors, air pollution, tobacco smoke, and physiological fluids are of such complexity that only high-efficiency capillary columns are capable of an adequate degree of resolution. The use of high-resolution chromatography for both research and routine analytical purposes requires extended use of computer techniques. The application of computers is considered in view of the problems associated with gas chromatography-mass spectrometry, technology of capillary columns and reproducibility of retention data and quantification. The value of a new efficient sampling method for routine headspace analysis is suggested. Examples of complex mixtures from aroma and biomedical research are illustrated and the application of computer-based pattern recognition to such samples is discussed.

306. Novotny, M., Farlow, R.

A simple method for concentrating dilute high-boiling samples for capillary gas chromatography.

ABSTRACT: Diluted samples of high-boiling compounds in organic solvents or derivatization reagents can be effectively concentrated prior to gas chromatography on a pre-column which contains a small amount of siliceous support provided and deactivated with a non-extractable (supposedly monomolecular) layer of stationary phase. It has been shown that this method is particularly suitable for concentration and sampling of biologic materials onto high-resolution capillary columns. This sampling procedure is superior to the low-temperature direct sample introduction via syringe. Excellent reproducibility with nanogram samples has been obtained.

307. Novotny, M.
Contemporary capillary gas chromatography.
ANAL. CHEM. 50(1): 16A-32A., 01/--/78.

ABSTRACT: A review of capillary gas chromatography discussing: glass columns, sampling techniques, various detectors, applications and data analysis.

308. Nygren, S.
Exponential flow programming in gas chromatography.
J. CHROMATOGR. 142: 109-116, 1977.

ABSTRACT: The flow-rate of the carrier gas chromatography can be programmed by a technique developed for use with capillary columns. Provided that the flow-rate is an exponential function of time, the chromatograms obtained are very similar to those obtained with linear temperature programming. Two types of flow programmers have been constructed, both of which are continuously operating mechanical systems controlled by digital electronic units. The effect of flow programming compared with temperature programming is illustrated by a few chromatograms.

309. O'Donnell, A., Dravnieks, A.
Pittsburgh sample sets. 2 p.

ABSTRACT: Using a GC with a flame ionization detector (FID), samples taken from two Pittsburgh locations were measured for trace organics. The results are contained here.

310. O'Keefe, A. E.
Advances in assembling permeation tubes.
ANAL. CHEM. 49(8): 1278-1279, 07/--/77.

ABSTRACT: Since publication of our initial article on permeation tubes, these simple devices have attained wide acceptance as accurate primary standards for the calibration of air pollutant measurement methods and instruments. Concurrently, certain improvements have been made in the method of assembling permeation tubes, resulting in a simpler procedure and a more reliable product.

311. Oakley, D. T.
Natural radiation exposure in the United States. NTIS Document No. PB-235-795 68 p., 1972.

ABSTRACT: The exposure of man to natural radiation sources in the U.S. has been estimated by considering the distribution of the population with respect to certain factors, principally geology and elevation, which influence exposure to terrestrial and cosmic radiation. The average population elevation of the U.S. was determined to be approximately 700 ft, and the average cosmic ray dose equivalent was estimated to be 44 mrem/yr. Included in this document is an estimate of man's dose exposure to radiation based on indoor measurements. Section 4.2 discusses the effect on the dose equivalent of housing construction materials, geological shielding, and the contribution of internal

emitters, especially potassium-40. A tabular summary of indoor measurements is provided.

312. Olansky, A. S., Deming, S. N.

Optimization and interpretation of absorbance response in the determination of formaldehyde with chromotropic acid.

ANAL. CHIM. ACTA 83(1): 241-249, 1976.

313. Olin, J. G.

A new virtual impactor (dichotomous sampler) for fine particle air quality monitoring. Paper no. 78-75.4 16 p.

ABSTRACT: A new manual virtual impactor, often referred to as a dichotomous sampler, has been developed for sampling and size fractionating suspended particles into two size fractions: greater than 3.5 microns (coarse, non-respirable particles) and less than 3.5 microns (fine, respirable particles). The virtual impactor is applicable to outdoor air quality monitoring or indoor monitoring in occupational environments. The two particle fractions are collected uniformly on two 37mm Teflon membrane filters, facilitating chemical analysis by X-ray fluorescence or gravimetric analysis by micro-balance or beta radiation attenuation. The virtual impactor head is a new single stage design with a cut-point of 3.5 microns and a flow rate of 1 cubic meter/hour. The maximum internal loss is only 2% and occurs at the cut-point. The flow controller maintains the total flow constant within plus or minus 3 over a 0 to -40 cm Hg pressure drop across the fine-particle filter. The unique flow controller maintains a constant pressure differential across a valve on the exit side of the vacuum pump by throttling the flow on the inlet side of the vacuum pump.

314. Osman, S. F., Barson, J. L.

Solvent fractionation of Girard T derivatives of carbonyl compounds using dimethyl sulfoxide.

ANAL. CHEM. 39(4): 530-531, 1967.

315. Owens, D. F., Rossano, A. T.

Design procedures to control cigarette smoke and other air pollutants.

ASHRAE TRANS. 75, Part I: 93-102, 1969.

ABSTRACT: A means for analyzing the air cleaning requirements of an air supply system is presented in this paper. In the analysis of an air cleaning problem, the types and amounts of emissions from indoor sources must be determined. Smoking, body emanation, and urban atmospheric pollutants have been identified as such sources. Information on the emission rate for these sources are provided in tabular form. In addition, a model for the determination of pollution concentrations is presented.

316. Pagnotto, L. D.

Collection and analysis of gases and vapors.

AIR SAMPLING INSTRUMENTS FOR EVALUATION OF ATMOSPHERIC CONTAMINANTS. 5TH ED. R2-R18, 1978.

ABSTRACT: This chapter deals with collection and analysis of gases and vapors commonly found in the industrial environment. It is limited to sampling for subsequent laboratory analysis. It does not, therefore, include any discussions of direct reading instruments, colorimetric indicators, tape samplers, and other 'on the spot' testing devices. These devices are adequately covered in Sections A, M, S, and U.

317. Papa, L. J.

Colorimetric determination of carbonyl compounds in automotive exhaust as 2,4-dinitrophenylhydrazones.

ENVIRON. SCI. TECHNOL. 3(4): 397-398, 1969.

318. Papa, L. J., Turner, L. P.

Chromatographic determination of carbonyl compounds as their 2,4-dinitrophenylhydrazones: I. Gas chromatography.

J. CHROMATOGR. SCI. 10(12): 744-747, 1972.

319. Patel, C. K. N.

Laser detection of pollution.

SCIENCE 202: 157-173, 10/13/78.

ABSTRACT: Spectroscopic analysis is a useful technique for identifying and quantitatively determining the presence of specific gaseous constituents. Development of high-power tunable lasers has made the spectroscopic technique for detection of trace constituents in the atmosphere very attractive for practical applications. In this article three of the currently used modes for laser detection of pollution are reviewed: (i) long-path measurements, (ii) laser Raman (differential absorption) measurements, and (iii) optoacoustic detection. Progress in the field has been extremely rapid in the last few years and very useful and reliable data on air pollution can now be obtained routinely with the techniques described.

320. Paz, M. A., Blumenfeld, O. O., Rojkind, M., Henson, E., Furfine, C., Gallup, P. M.

Determination of carbonyl compounds with n-methyl benzothiazolone hydrazone.

ARCH. BIOCHEM. BIOPHYS. 109: 548-559, 1965.

321. Pellizzari, E. D., Bunch, J. E., Carpenter, B. H., Sawicki, E.

Collection and analysis of trace organic vapor pollutants in ambient atmospheres: Technique for evaluating concentration of vapors by sorbent media.

ENVIRON. SCI. TECHNOL. 9(6): 552-555, 06/--75.

ABSTRACT: An analytical technique is described for evaluating collection efficiencies of sorbents during the concentration of hazardous vapors from a flowing stream. The polymeric beads—Tenax GC, Porapak Q, Chromosorb 101 and Chromosorb 104 were greater than or equal to 90% efficient in trapping vapors of epoxides, B-lactones, sulfonates, sultones, N-nitrosamines, chloroalkyl ethers, aldehydes, and nitro compounds from synthetic air-vapor mixtures at 0.25 l/minute. Tenax and Chromosorb 101 were evaluated at sampling rates up to 9 l/minute and maintained efficiencies of greater than or equal to 90%. Carbowax 600 and 400, and oxypionitrile coated or chemically bonded to supports were also highly efficient (greater than 90%).

322. Pellizzari, E., Carpenter, B. H., Bunch, J. E., Sawicki, E.

Collection and analysis of trace organic vapor pollutants in ambient atmospheres: Thermal desorption of organic vapors from sorbent media.

ENVIRON. SCI. TECHNOL. 9(6): 557-560, 06/--75.

ABSTRACT: A thermal desorption gas liquid chromatograph interface is described for recovering hazardous substances concentrated on sorbents in glass cartridges. The interface consists of a desorption chamber, a six port two position high-temperature low-volume valve, a Ni capillary trap, and a temperature controller. The temperature rise time was determined in the center of cartridges for several sorbents. The heating rates were: PCB and BPL activated carbons > oxypionitrile and Carbowax 400 chemically bonded

to Poracil C > Chromosorb 104 > Tenax GC > Chromosorb 101. The heating rate was linear for all sorbents up to 65% of the set desorption chamber temperature (60-90 sec) and required several minutes thereafter to reach the final temperature. The percent recovery of several hazardous vapors adsorbed on Tenax GC using thermal desorption was greater than or equal to 90% at the 50 and 100 ng level.

323. Pellizzari, E. D.

Development of method for carcinogenic vapor analysis in ambient atmospheres. NTIS-PB 239770 162 p., 1974.

324. Pellizzari, E. D.

Development of analytical techniques for measuring ambient atmospheric carcinogenic vapors. NTIS-PB 250620 199 p., 1975.

325. Pellizzari, E. D., Bunch, J. E., Berkley, R. E., McRae, J.

Collection and analysis of trace organic vapor pollutants in ambient atmospheres: The performance of a Tenax GC cartridge sampler for hazardous vapors.

ANAL. LETT. 9(1): 45-63, 1976.

ABSTRACT: The performances of several sorbents as collection media for the quantitative concentration and analysis of volatile, hazardous, vapor-phase compounds from ambient atmospheres were evaluated under a variety of conditions relevant to field sampling. Tenax GC was found to be superior to other sorbents in most cases. The effects of humidity, background air pollution, repeated re-use of sorbent, and transportation and storage of collected samples were investigated.

326. Pellizzari, E. D., Bunch, J. E., Berkley, R. E., McRae, J.

Determination of trace hazardous organic vapor pollutants in ambient atmospheres by gas chromatography/mass spectrometry/computer.

ANAL. CHEM. 48(6): 803-807, 05/1976.

ABSTRACT: Tenax GC cartridges were used to collect organic vapors in the ambient air of Houston, Tex., the Los Angeles, Calif. Basin, and the Raleigh, N.C. area. The vapors were thermally desorbed and analyzed by a capillary gas-liquid chromatograph coupled to a mass spectrometer. An on-line computer recorded data on magnetic tape and generated normalized mass spectra and mass fragmentograms. The ubiquitous background of hydrocarbons from automobile exhaust were substantially resolved from each other, and 21 halogenated hydrocarbons were detected, including the carcinogens vinyl chloride and trichloroethylene, as well as numerous oxygen, sulfur, nitrogen, and silicon compounds.

327. Penkala, S. J., de Oliveira, G.

The simultaneous analysis of carbon monoxide and suspended particulate matter produced by cigarette smoking.

ENVIRON. RES. 9: 99-114, 1975.

ABSTRACT: The latest report from the Surgeon General outlined the need for studies on cigarette smoking in confined spaces with respect to the effects on nonsmokers in the same occupied space. Carbon monoxide (CO) and suspended particulate matter (SPM) produced by a cigarette smoking machine were monitored simultaneously in a nonventilated but well-mixed exposure chamber of 9.2 cubic centimeters. It was found that removal mechanisms were operating for both species. Generation rates of CO and SPM were estimated to be 82.7 and 17.2 per cigarette, respectively. CO results agree well with other studies, but the SPM rates are somewhat lower than data obtained by immediate filtration methods. The effect of a person smoking one pack per day is evaluated in terms of the CO and SPM concentrations reached in a work space occupied by one smoker and one nonsmoker. Under reasonable ventilation practices, the CO ambient air quality standards are met, but SPM standards are generally exceeded.

328. Penzias, G. J.

Gas chromatograph peaks identified on-line by a new grating infrared spectrophotometer.

ANAL. CHEM. 45(6): 890-895, 05/--/73.

ABSTRACT: A new, double-beam ratio recording grating infrared spectrophotometer that scans from 2.5 to 15 micrometers in 6 seconds has been developed. It is designed to identify eluting gas chromatograph fractions on-line for routine analysis. Heated sample and reference cells are integral with the spectrophotometer, which utilizes a rapid-response, room temperature detector. The new instrument was used to record infrared spectra of eluting GC fractions of various samples including coatings paints, polymers, and other organic compounds. Components of unresolved GC peak were identified by scanning several spectra during the elution of a single peak. Fractions as small as 0.02 microliter were identified (e.g., a 1% component of a 2-microliter sample injected into the gas chromatograph).

329. Peters, J., Frank, R.

Health effects of ozone exposure in Canadians versus Southern Californians.

AM. REV. RESPIR. DIS. 111(6): 902, 1975.

ABSTRACT: Published studies on health effects of exposure to ozone (O₃) report that Canadians might be more reactive than persons living in southern California. The source of this difference was investigated in the present study by examining subjects from the two areas in question together in California to compare methods and responses. Exposing both subject groups to 0.37 ppm of O₃ in purified air, it was observed that the Canadians were more sensitive, on the average, to atmospheric ozone. Adaption of Southern Californians to chronic ambient O₃ exposure is a rational hypothesis that can explain this difference.

330. Petersen, G. A., Sabersky, R. H.

Measurements of pollutants inside an automobile.

J. AIR POLLUT. CONTROL ASSOC. 25(10): 1028-1032, 1975.

ABSTRACT: A series of experiments was conducted to determine the concentration of certain pollutants inside a car under typical driving conditions. The work was performed during the summer months in the Los Angeles area and measurements of O₃, CO, NO, and NO_x were taken. It was found that the O₃ concentration in the passenger compartment may be maintained at relatively low values provided that the influx of outside air is limited. The low levels were explained by decay of O₃ on surfaces within the compartment. The average concentration of the other components inside the car is about equal to that on the outside. In the current tests, however, the measured concentrations did not exceed any of the present standards.

331. Phair, J. J., Shephard, R. J., Carey, G. C. R., Thomson, M. L.

The estimation of gaseous acid in domestic premises.

BR. J. IND. MED. 15: 283-292, 1958.

ABSTRACT: This paper discusses some of the problems encountered in the construction of apparatus used to measure the concentrations of gaseous acids and other variables within the microenvironment of the home. Observations are offered on the relationship between domestic and community levels of contaminants in the atmosphere. A description is given of a small sequence sampler that provides six hourly readings of gaseous acid concentrations in the home. It was found that such measurements largely reflect the amount of SO₂ in a suburban atmosphere, that indoor measurements show a tendency to follow outdoor readings with a lag of 2-3 hours, and that indoor levels tend to be much lower and lack sharp peaks.

332. Phillips, M. P., Sievers, R. E., Goldan, P., Kuster, W. C., Fehsenfeld, F. C.

Enhancement of electron capture detector sensitivity to nonelectron attaching compounds by addition of nitrous oxide to the carrier gas.

ANAL. CHEM. 51(11): 1819-1825, 09/--/79.

333. Pierson, R. H., Fletcher, A. N., Gantz, E. St. Clair

Catalog of infrared spectra for qualitative analysis of gases.

ANAL. CHEM. 28(8): 1218-1239, 08/--/56.

ABSTRACT: A catalog of infrared spectra of 66 gases and vapors is presented, which should increase the usefulness of the infrared technique for qualitative analysis of unknown gas mixtures. A chart is also given as an aid to rapid identification of the constituents of an unknown sample. Threshold values revealed by the chart show the sensitivity of the infrared method under specific conditions for the various gases and vapors reported. The methodologies illustrated should be applicable to more extensive cataloging of gases and vapors.

334. Pinisina, I. A.

Use of 2,4-dinitrophenylhydrazine for determining carbonyl compounds in the air.

GIG. SANIT. 37(4): 78-81, 1972.

335. Porter, K., Volman, D.H.

Flame ionization detection of carbon monoxide for gas chromatographic analysis.

ANAL. CHEM. 34(7): 748-749, 06/--/62.

ABSTRACT: Carbon monoxide may be detected by a flame ionization detector after catalytic conversion to methane. A high percentage conversion is obtained, mainly independent of catalyst temperature over the operating range. This method is considerably more sensitive than katharometer detection. It is suggested that carbon dioxide and hydrogen may be detected by use of the same nickel catalyst.

336. Qvarfort, I., Sillen, L. G.

Electrometric investigation of equilibria between mercury and halogen ions, Part VII: Complexes between Hg and I, and some equilibria involving solid mercury (I) iodide and mercury (II) iodide.

ACTA CHEM. SCAND. 3: 505-519, 1949.

337. Ralls, J. W.

Higher recoveries of carbonyl compounds in flash exchange gas chromatography of 2,4-dinitrophenylhydrazones.

ANAL. CHEM. 36(4): 946, 1964.

338. Randolph, T. G.

Domiciliary chemical air pollution in the etiology of ecologic mental illness.

THE INTERNATIONAL JOURNAL OF SOCIAL PSYCHIATRY 16(4): 243-265, 1970.

ABSTRACT: Certain types of domiciliary chemical air pollution can impinge on the physical and mental health of susceptible persons living in these environments. With daily exposure to a wide range of chemicals and gases in the home environment, the possibility exists that these pollutants could be the cause of chronic illnesses. In this paper, the author attempts to demonstrate the etiological role of air pollutants in mental illness.

Experts from representative subject histories illustrate the scope of the problem of docimiliary air pollution. (The reader should be aware that these examples are taken out of context).

339. Rasmussen, R. A., Harsch, D. E., Sweany, P. H., Krasnec, J. P., Cronn, D. R.

Determination of atmospheric halocarbons by a temperature-programmed gas chromatographic freezeout concentration method.

J. AIR POLLUT. CONTROL ASSOC. 27(6): 579-581, 06/—/77.

ABSTRACT: A simple, versatile method has been developed for routine use in the analysis of atmospheric samples for halogenated compounds by EC/GC and gas chromatography/mass spectrometry (GC/MS). In conjunction with sample concentration by freezeout, the column is temperature-programmed to provide separation of the various halogenated components while maintaining a reasonably short retention time for all components. The expanded capability allows the simultaneous determination of 11 halocarbons in a single analysis with sufficient sensitivity and adequate precision for analysis of background tropospheric and lower stratospheric air samples. The procedure was designed to facilitate the analysis of air samples obtained by means of pressurized air collection systems but would be applicable for other pressurized gaseous samples as well. Positive-pressure sample transfer minimizes the possibility of contamination from the transfer step involved in the concentration procedure.

340. Rayner, A. C., Jephcott, C. M.

Microdetermination of formaldehyde in air.

ANAL. CHEM. 33(4): 627-630, 04/—/61.

341. Reckner, L. R., Scott, W. E., Biller, W. F.

Composition and odor of diesel exhaust.

PROC., AM. PET. INST. 45(3): 133-147, 1965.

342. Renzetti, N. A., Bryan, R. J.

Atmospheric sampling for aldehydes and eye irritation in Los Angeles smog: 1960.

J. AIR POLLUT. CONTROL ASSOC. 11: 421-424, 427, 1961.

343. Repace, J. L., Lowrey, A. H.

Indoor air pollution, tobacco smoke, and public health.

SCIENCE 208: 464-472, 05/02/80.

344. Richardson, N. A., Middleton, W. C.

Evaluation of filters for removing irritants from polluted air.

HEAT., PIPING AIR COND. 30: 147-154, 1958.

ABSTRACT: Two air filter media were evaluated by their effectiveness in reducing human sensory irritation resulting from Los Angeles smog. The sensory response of one group of subjects working in a filtered atmosphere was compared with the response of another similar group working in a nonfiltered atmosphere in identical, adjacent rooms. Sensory response was measured daily and simultaneous measurements of the physical composition of the air were obtained. Much of the testing was with activated carbon filters varying in air detention time between 0.032 and 0.003 seconds. A significant decrease in irritation was recorded over the entire range of air detention times. Differences in effectiveness with respect to air detention time were not statistically

significant, although a trend of decreasing effectiveness was observed as air detention time was reduced. Effectiveness of activated carbon in removing oxidants was directly related to detention time. NO₂ was reduced by activated carbon during its early use. A particulate filter which effectively removes particles having a diameter less than 0.005 microns was also tested. No decrease in sensory irritation was detected. Correlations computed between measurements taken in the nonfiltered atmosphere indicate that sensory irritation is highly related to oxidant level and moderately to temperature.

345. Riley, R. L.

Editorial - The ecology of indoor atmosphere: Airborne infection in hospitals.

J. CHRONIC DIS. 25: 421-424, 1972.

ABSTRACT: The problem of maintaining a germ-free environment within a hospital is discussed in this editorial. Indoor atmospheres, because they are enclosed, generally do not provide vast dilution which occurs outdoors. Therefore, the enclosed atmosphere of a hospital building and its human occupants constitute an ecological unit. Airborne organisms originating from the respiratory tracts of occupants disperse through this enclosed environment via the air system. The consequences of this ecological communism is particularly unfortunate in hospitals because of the need to maintain a germ-free environment. Since the air of a hospital is the medium of transmission of airborne infection, air disinfection is the appropriate control measure. Upper air irradiation with ultraviolet is capable of rapid disinfection of the air, and has been used successfully in the past.

346. Rinehart, E. A.

Analytical microwave spectrometry.

ANAL. CHEM. 49(2): 249A-262A, 02/--/77.

ABSTRACT: Microwave spectrometry is a highly specific method for identifying particular polar compounds and with extra effort is capable of quantitative analysis of those compounds in mixtures. The major application at present appears to be in the environmental areas of air pollutant analysis, monitoring of off-gases in synthetic fuels production, and similar areas. Currently, the major limitation is not in the instrumentation, but in the availability of information about suitable transitions for monitoring. The lack of an extensive catalog of microwave transitions has prevented the application of microwave spectrometry to routine gas analysis. An excellent beginning of a cataloging program has been made by W.F. White (11) at NASA-Langley, and it appears that as more workers enter the field, the necessary extensive catalogs will become available.

347. Ripperton, L. A., Kornreich, L., Worth, J. J. B.

Nitrogen dioxide and nitric oxide in nonurban air.

J. AIR POLLUT. CONTROL ASSOC. 20(9): 589-592, 1970.

348. Roffael, E.

Effects of the formaldehyde content in urea resins on their reactivity and the formaldehyde emission of chipboard bonded with same. Einfluss des formaldehydgehaltes in harnstoffharzen auf ihre reaktivitat und die formaldehydabgabe damit gebundener spanplatten.

HOLZ ROH-WERKST. 34: 385-390, 1976.

349. Russell, J. W.

Analysis of air pollutants using sampling tubes and gas chromatography.

ENVIRON. SCI. TECHNOL. 9(13): 1175-1178, 12/--/75.

ABSTRACT: Sampling tubes filled with gas chromatographic packings were excellent for

concentrating organic pollutants from air. The collected pollutants were thermally desorbed into a gas chromatograph and quantitated using flame ionization or flame photometric detection. Advantages of the technique are ppb sensitivity and quantitative recovery, as well as superior sample stability and sampling convenience. The suitability of various sampling tube packings for collecting specific compounds was shown by determination of breakthrough volumes and recovery values.

350. Russell, M. A. H., Cole, P. V., Brown, E.

Absorption by non-smokers of carbon monoxide from room air polluted by tobacco smoke.

LANCET 576-579, 03/17/73.

ABSTRACT: An experiment where 20 subjects spent an average of 78 minutes in a 43 cubic meter smoke-filled room is reported in this paper. The smoke was produced by burning and smoking 80 cigarettes and two cigars. The average ambient carbon monoxide (CO) was 38 ppm; the mean carboxyhemoglobin (COHb) level of the 12 nonsmokers increased from 1.6 percent to 2.6 percent, and from 5.9 percent to 9.6 percent in the cigarette and cigar smokers. It was suggested that the amount of CO absorbed by nonsmokers through passive smoking was almost equal to smoking and inhaling one cigarette.

351. Sabersky, R. H., Sinema, D. A., Shair, F. H.

Concentrations, decay rates, and removal of ozone and their relation to establishing clean indoor air.

ENVIRON. SCI. TECHNOL. 7(4): 347-353, 1973.

ABSTRACT: The ozone (O₃) concentrations inside buildings have been found in many instances to be undesirably high in photochemically smoggy areas. Transitory O₃ concentrations in typical buildings in such areas were found to lag in time and to be only slightly less than corresponding outdoor concentrations. Methods and simple procedures that can be employed to reduce these high indoor levels are discussed in this paper. Ozone decomposition within buildings involved a heterogeneous mechanism. Decomposition rate constants for several common surfaces were found to range in value from about .01 - .003 cubic feet/square foot/minute. Rubber, fabrics and plastics appeared to decompose ozone much more rapidly than metals and glass. All materials demonstrated a reduction in the rate constant in extended use. One material, plywood, showed some recovery after a two-day exposure to an ozone-free atmosphere. Experiments indicated that certain filters, especially activated charcoal, can be used to reduce indoor levels of ozone well below the minimum acceptable limits. Calculations based upon a "stirred-tan" reactor model yielded results similar to those observed with respect to transitory indoor vs. outdoor concentrations of ozone.

352. Sardinias, A. V., Most, R. S., Giulietti, M. A., Honchar, P.

Health effects associated with urea-formaldehyde foam insulation in Connecticut.

J. ENVIRON. HEALTH 41(5): 270-272, 03/--/79.

ABSTRACT: Urea-formaldehyde foam insulation has recently become the subject of great concern in Connecticut due to the health effects associated with its use. The full scope of the problem has not yet been estimated. The Connecticut State Department of Health received 80 complaints from consumers who have had urea-formaldehyde insulation installed in their homes between the dates of December 29, 1977 and August 25, 1978. The energy crisis spurred over 14,000 telephone inquiries to the state Energy Office to obtain information about home insulation during that same time period. A random survey showed that approximately 48% of these people went on to have some type of insulation installed in their homes.

353. Sawicki, E., Stanley, T. W., Hauser, T. R.

Detection of arylidene arylhydrazones and thereby differentiation of aromatic aldehydes and ketones.

CHEM.-ANAL. 47(31): 87-88, 1958.

354. Sawicki, E., Hauser, T. R.
Spot test detection and colorimetric determination of aliphatic aldehydes with 2-hydrazinobenzothiazole: Application to air pollution.
ANAL. CHEM. 32(11): 1434-1436, 10/--/60.
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355. Sawicki, E., Hauser, T. R., Stanley, T. W., Elbert, W.
The 3-methyl-2-benzothiazolone hydrazone test: Sensitive new methods for the detection, rapid estimation, and determination of aliphatic aldehydes.
ANAL. CHEM. 33(1): 93-96, 01/--/61.
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356. Sawicki, E., Hauser, T. R., McPherson, S.
Spectrophotometric determination of formaldehyde and formaldehyde-releasing compounds with chromotropic acid, 6-amino-1-naphthol-3-sulfonic acid (J acid) and 6-anilino-1-naphthol-3-sulfonic acid (phenyl J acid).
ANAL. CHEM. 34: 1460-1464, 1962.
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357. Sawicki, E., Stanley, T. W., Pfaff, J.
Spectrofluorimetric determination of formaldehyde and acrolein with J Acid: Comparison with other methods.
ANAL. CHIM. ACTA 28: 156-163, 1963.
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358. Scarinelli, F. P., O'Keeffe, A. E., Rosenberg, E., Bell, J. P.
Preparation of known concentrations of gases and vapors with permeation devices calibrated gravimetrically.
ANAL. CHEM. 42(8): 871-876, 1970.
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359. Schaefer, V. J., Mohnen, V. A., Veirs, V. R.
Air quality of American homes.
SCIENCE 175: 173-175, 1972.
ABSTRACT: In a survey of particulate fallout in homes, a relation was found between the pollution inside and outside a home. The level inside the home also depends on whether the home is urban, suburban, or rural. Bathrooms and kitchens show heavier fallout than living rooms or bedrooms. It was also found that the average mass of collected fallout sample indoors increased dramatically when windows were open during most of the experiment.
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360. Schaplowsky, A. F., Polk, L. G., Oglesbay, F. B., Morrison, J. H., Gallagher, R. E., Berman, W.
Carbon monoxide contamination of the living environment: A national survey of home air specimens and children's blood samples., 1973.
ABSTRACT: A total of 2,299 children were tested for COHb levels. Of these, 517 or 22.5 percent had COHb levels of 3 percent or more. COHb levels as high as 7.99 percent were reported and the mean level of those with concentrations of 3 percent or more was 4.04 percent. A total of 1,820 dwelling units was tested for CO concentrations in the air. Of these, 306 or 16.8 percent had concentrations of 10 ppm or more in at least one area in which a fuel-burning appliance was located. Concentrations of more than 200 ppm were

reported in a number of dwellings. Improper venting, lack of maintenance, and defective appliances were the principal causes of the high CO production. A larger portion of mobile home units were found to have elevated CO levels than either single or multiple-type dwellings, but this was not statistically significant.

361. Schawlow, A. L.

Laser spectroscopy of atoms and molecules.

SCIENCE 202(4364): 141-156, 10/13/78.

ABSTRACT: A review of the new laser techniques that are creating an entire wave of spectroscopic experiments.

362. Schiff, H.

A new series of organic diamines: Part 2.

ANN. CHEM. PHARMACIE 140: 92-137, 1866.

363. Schlesinger, G., Miller, S. L.

Equilibrium and kinetics of glyconitrile formation in aqueous solution.

J. AM. CHEM. SOC. 95(11): 3729-3735, 1973.

364. Schmeltz, I., Hoffman, D., Wynder, E. L.

The influence of tobacco smoke on indoor atmospheres.

PREV. MED. 4(1), 1975.

ABSTRACT: This study attempts to determine if tobacco smoke in the indoor environment produces a significant health problem for those who spend a great deal of time indoors in offices, bus or train terminals, airports, theaters, sports arenas, public buildings, and submarines. Passive smoking does result in an elevation of carboxyhemoglobin (COHb) in nonsmokers, and chronic exposure to CO may cause some physiological distress in nonsmokers. However, additional studies are needed to establish whether passive inhalation of tobacco smoke represents a significant risk to human health.

365. Schneider, W., Bruderreck, H., Halasz, I.

Gas chromatographic separation of hydrocarbons C1 to C8 by carbon number using packed capillary columns.

ANAL. CHEM. 36(8): 1533-1540., 07/--/64.

ABSTRACT: Capillary columns were packed with graphited carbon black and impregnated with about 0.4 wt.% of squalane. The order of the retention volumes of hydrocarbons in the C1 to C8 range corresponds, with a few exceptions only, to the number of carbon atoms in the molecules. Retentions relative to n-pentane on nonimpregnated and impregnated graphited carbon black are tabulated.

366. Schomburg, G., Dielmann, G.

Use of retention increments for identification and correlation of saturated and unsaturated cyclopropane hydrocarbons by means of Kovats indices.

ANAL. CHEM. 45(9): 1647-1658., 08/--/73.

ABSTRACT: Retention data of a large variety of substituted cyclopropane hydrocarbons are tabulated and used to derive retention increments for many isomers. The use of increments which are defined on the basis of molecular structural elements is mainly a

pragmatical approach for a better understanding of retention behavior of isomeric compounds. The increments are related to the influences of partial molecular configurations on intermolecular solute-solvent interaction. The high standard and reliability of retention index predictions with such increments is demonstrated. The problem of the precision of retention index determination is discussed with regard to different modes of application for identification and correlation of separated species of mixtures.

367. Schomburg, G., Dielmann, R., Husmann, H., Weeke, F.

Gas chromatographic analysis with glass capillary columns.

J. CHROMATOGR. 122: 55-72, 1976.

ABSTRACT: A critical review of the current situation in glass capillary column chromatography with commercial instruments is presented preferably in the light of experience and experiments in our laboratories. Progress in production, connection and advanced applications of glass capillary columns is surveyed. Various sampling methods (splitting, splitless injection, selective sampling) with regard to different types of samples have been studied. The use of selective detectors (nitrogen and phosphorous flame ionization, electron capture, gas chromatography-mass spectrometry) is discussed and a simple automated double-column set-up for back-flushing in routine capillary chromatography is considered.

368. Schomburg, G., Behlau, H., Dielmann, R., Weeke, F., Husmann, H.

Sampling techniques in capillary gas chromatography.

J. CHROMATOGR. 142: 87-102, 11/11/77.

ABSTRACT: Four different sampling methods for capillary gas chromatography, including split and splitless sampling, have been investigated with respect to precise and accurate qualitative and quantitative analysis. A new method of direct sampling for capillary columns is presented and compared with the known techniques with respect to resolution, reproducibility of retention, decomposition of sensitive sample components and discrimination of high-boiling components in quantitative analysis. Multi-dimensional arrangements using capillary columns for the 'main' separation as the most flexible and efficient sampling devices are discussed. If by selective sampling in such set-ups only a partial analysis of those components is achieved, which are of real interest in a particular analytical problem, analysis time can be saved and the performance of the separation can be improved.

369. Schuck, E. A., Stephens, E. R., Middleton, J. T.

Eye irritation response at low concentrations of irritants.

ARCH. ENVIRON. HEALTH 13(5): 570-575, 11/--/66.

370. Seizinger, D. E., Dimitriades, B.

Oxygenates in automotive exhausts: Effect of an oxidation catalyst. Report of Investigations 7837 21 p., 1973.

371. Selim, S.

Separation and quantitative determination of traces of carbonyl compounds as their 2,4-dinitrophenylhydrazones by high-pressure liquid chromatography.

J. CHROMATOGR. 136(2): 271-277, 1977.

372. Shafir, A. I.

Dwelling house as an object of radiation: Hygienic investigation.

ABSTRACT: The article specifies the main sources of radioactivity in dwelling houses: a) radon and thoron and their derivatives brought in premises from the soil; b) radioactive construction material. The level of natural radioactivity within the dwelling houses is quite low. When the radioactivity of the outside environment is high (that of ground, vegetation, etc.), the dwelling house may easily become the specific accumulator of radioactive contamination. The article presents concrete examples demonstrating that in treating the problem of radiation safety for humans, the radioactivity factor in dwellings is as important as that in the atmosphere. The author discusses most urgent problems of the radiation hygiene in dwelling houses.

373. Shair, F. H., Heitner, K. L.

Theoretical model for relating indoor pollution concentrations to those outside.

ENVIRON. SCI. TECHNOL. 8(5): 444-451, 1974.

ABSTRACT: A general ventilation model, which relates indoor pollutant concentrations to those outside, is discussed in detail. When the time interval associated with changes in the outdoor concentration is long compared to that required either to change the air within the building or to remove the pollutant by internal means, the indoor concentration of pollutant can be related to the outdoor concentration by means of a simple expression. In the case of indoor ozone associated with buildings located in photochemically smoggy regions, there is a good agreement between theory and experiment. Theoretical considerations suggest that the indoor levels of ozone in many commercial buildings located in Los Angeles could be substantially reduced rather quickly and possibly with relatively little effort.

374. Shepherd, R. J., Turner, M. E., Carey, G. C. R., Phair, J. J.

Correlation of pulmonary function and domestic microenvironment.

J. APPL. PHYSIOL. 15: 70-76, 1960.

ABSTRACT: The correlation between objective tests of pulmonary function and simultaneously recorded changes in the residential environment is examined here. Pathological responses to contaminated atmosphere and procedures likely to be of value in future air hygiene studies are discussed. Pulmonary pressures, total and timed vital capacity, functional residual capacity and carbon monoxide uptake have been correlated with temperature, humidity, suspended particulate matter, and gaseous acid in a 3-month prospective survey of 10 cardiorespiratory cripples. Results have been analyzed by a sequential multiple regression technique, and significant relationships demonstrated between pulmonary function measurements and time, humidity, and suspended particulate matter. The immediate response to suspended particulate matter was consistent with bronchoconstriction, although the most significant features were a transient depression of carbon monoxide uptake. The prolonged depression of carbon monoxide uptake, starting 4 days after an intense episode of pollution, did not show itself as a significant long-lag coefficient for the survey as a whole; the existence of a threshold dose of suspended particulate to produce structural damage is postulated.

375. Sibbett, D. J., Moyer, R. H., Milly, G. H.

Emissions of mercury from latex paints., 1972.

ABSTRACT: Recent studies utilizing automated instrumentation have detected levels of mercury vapor and mercury compounds in the air of living spaces painted with latex paints after the passage of considerable time. Although this phenomenon has been indicated previously, no recognition has been made of the long-lasting diffusion of mercury compounds from coated surfaces and no quantitative measures of these effluents have been made available. The physiological effects of extended exposures to these relatively low concentrations of mercury-containing vapors have not been established. This point may be of importance particularly for children in whom development of nerve tissue is incomplete. The report of an international committee studying the maximum allowable concentrations of mercury compounds indicates that the levels of exposure observed in these studies are below the limits recommended for adults in 8-hour exposure. The values obtained are above those recommended by the Soviets for 24-hour exposures as described in the Bulletin of the World Health Organization in 1965.

376. Siegel, D., Muller, F., Neuschwander, K.

Fully automatic measurement of hydrocarbon emission: Selective measurement of C1-C5 hydrocarbons and benzene.

CHROMATOGRAPHIA 7(8): 399-406, 08/--/74.

ABSTRACT: The widely different action of organic compounds on humans, animals and plants requires selective determination of hydrocarbons. The development of an automatic gas chromatographic method for measurement of hydrocarbons in air is described. With this method the C1-C5, C6, and C6H6 hydrocarbons can be separated and measured; cycle-period: 30 min. The conditions of measurement are discussed and the analytical capacity of the system is illustrated by chromatograms which are made in stationary and mobile situations. The assessment of the measured values and the control of the working parameters of the system after its integration in the air pollution network of the state Baden-Wurttemberg are mentioned.

377. Sievers, R. E., Barkley, R. M., Eiceman, G. A., Shapiro, R. H., Walton, H. F., Kolonko, K. J., Field, L. R.

Environmental trace analysis of organics in water by glass capillary column chromatography and ancillary techniques.

J. CHROMATOGR. 142: 745-754, 1977.

ABSTRACT: A method employing a polymeric sorbent has been used for analysis of volatile organic components in water. Trace level organics are sparged from water with nitrogen gas and are concentrated on Tenax GC prior to analysis with either flame ionization gas chromatography or gas chromatography-mass spectrometry. Glass capillary columns were used to obtain maximum resolution of chromatographic peaks. Specifically, the method has been applied to a qualitative and quantitative study of the products which result from ozonization of secondary treated domestic wastewater. The principal volatile products of ozonolysis are n-hexanal, n-heptanal, n-octanal and n-nonanal. Representative samples contained 0.7 ppb ** of n-heptanal and less than 1 ppb of any of the volatile compounds.

378. Sillen, L. G.

Electrometric investigation of equilibria between mercury and halogen ions, IV: Redox titrations of Hg (I,II) solutions with halogen ions.

ACTA CHEM. SCAND. 1: 473-478, 1947.

379. Singh, H. B., Salas, L., Lillian, D., Arnts, R. R., Appleby, A.

Generation of accurate halocarbon primary standards with permeation tubes.

ENVIRON. SCI. TECHNOL. 11(5): 511-513, 05/--/77.

ABSTRACT: A number of permeation tubes for generating low concentration primary standards are tested for 18 halocarbons, and the permeation rate data are presented. In most cases, permeation tubes offer a satisfactory technique for the generation of accurate primary halocarbon standards.

380. Slawinska, D., Slawinski, J.

Chemiluminescent flow method for determination of formaldehyde.

ANAL. CHEM. 47(13): 2101-2109, 11/--/75.

ABSTRACT: Formaldehyde and gallic acid oxidized with aqueous alkaline hydrogen peroxide produce relatively strong chemiluminescence in the spectral range 560-850 nm (the Trautz-Schorigin reaction). The kinetics of this system have been measured as well as the chemiluminescence spectra and absorption and fluorescence spectra of intermediates and products. The effects of order of reagent addition and variation in oxygen pressure on

chemiluminescence have also been determined. Heat generation and variations in dissolved oxygen concentration have been measured as a function of time and order of reagent addition. The results are discussed in terms of the reaction mechanism with particular emphasis on the possible role of singlet molecular oxygen. The effects of reagent concentrations, pH, temperature, rate flow, and interfering compounds on the maximum of chemiluminescence intensity were measured. Chemiluminescence intensity is linearly proportional to formaldehyde concentration from 10^{-7} to 10^{-2} molar. Using the optimized system, a simple and rapid flow method for formaldehyde determination in water was developed with a mean error less than 1% and a detection limit of 1 microgram/liter.

381. Small, H., Stevens, T. S., Bauman, W. C.

Novel ion exchange chromatographic method using conductimetric detection.

ANAL. CHEM. 47(11): 1801-1809, 09/1975.

ABSTRACT: Ion exchange resins have a well known ability to provide excellent separation of ions, but the automated analysis of the eluted species is often frustrated by the presence of the background electrolyte used for elution. By using a novel combination of resins, we have succeeded in neutralizing or suppressing this background without significantly affecting the species being analyzed which in turn permits the use of a conductivity cell as a universal and very sensitive monitor of all ionic species either cationic or anionic. Using this technique, automated analytical schemes have been devised for Li, Na, K, Rb, Cs, NH₄, Ca²⁺, Mg²⁺, F, Cl, Br, I, NO₃, NO₂, SO₄²⁻, PO₄³⁻, and many amines, quaternary ammonium compounds, and organic acids. Elution time can take as little as 1.0 minute/ion and is typically 3 minutes/ion. Ions have been determined in a diversity of backgrounds, e.g., waste streams, various local surface waters, blood serum, urine, and fruit juices.

382. Soffian, G., Westlin, P. R.

Particulate emissions from apartment house boilers and incinerators.

J. AIR POLLUT. CONTROL ASSOC. 25: 269-273, 1975.

ABSTRACT: The information presented in this paper is directed to researchers in stack testing methodology and to those concerned with reduction of emissions through equipment upgrading programs. Extensive testing was done using the U.S. Environmental Protection Agency's Method 5 stack sampling train to obtain emission factors for existing apartment house boilers and incinerators in the City of New York. In addition to calculating emission factors, the researchers examined stack emission data to compare results of simultaneous emission tests and to compare the dry particulate catch of the sampling train with the total particulate catch which included the impinger catch. Conclusions reached as a result of the testing were that published emission factors for boilers burning moderately high-sulfur residual oil are applicable to New York City boilers burning low-sulfur residual oil. From tests of on-site incinerators, it was determined that previously published emission factors may be too high for well maintained and properly operated incinerators. The back half particulate catch was found to be relatively large, which may have resulted from condensation of unburned organics from the burning waste material.

383. Sojak, L., Janak, J., Rijks, J. A.

Capillary gas chromatography of alkylbenzenes, IV: Correlations between retention indices on stationary phases of different polarity and structure.

J. CHROMATOGR. 142: 177-189, 1977.

384. Sorensen, P. E., Andersen, V. S.

The formaldehyde-hydrogen sulphite system in alkaline aqueous solution: Kinetics, mechanisms, and equilibria.

ACTA CHEM. SCAND. 24(4): 1301-1306, 1970.

ABSTRACT: Kinetic and equilibrium data for the formaldehyde-hydrogen sulphite system, at 25 degrees C and an ionic strength of 0.1 are reported and mechanisms are discussed. The value of the acid dissociation constant of the formaldehyde bisulphate ion was found to

be E-11.7 M. Spectrophotometry in connection with a flow technique was used for the kinetic investigations. The rate of addition of sulphite to the anhydrous form of formaldehyde cannot be measured directly, as the dehydration of methylene glycol is the rate determining step of the overall reaction. The rate of decomposition of the addition product increases with increasing pH, but it has not been possible to elucidate the mechanism. Various authors have suggested a simple monomolecular process dominated by the most alkaline form of the addition product. The equilibrium experiments of the present paper seem to be in good agreement with this theory. However, a SN2-mechanism involving hydroxide ions seems to be in better agreement with the kinetic results.

385. Soukup, R. J., Scarpellino, R. J., Danielczik, E.

Gas chromatographic separation of 2,4-dinitrophenylhydrazone derivatives of carbonyl compounds.

ANAL. CHEM. 36(12): 2255-2256, 1964.

386. Spedding, D. J.

Sulphur dioxide uptake by limestone.

ATMOS. ENVIRON. 3: 683, 1969.

ABSTRACT: This is a short communication on the sulfur dioxide uptake by limestone. Because SO₂ has been implicated in the erosion of limestone buildings and structures, an investigation of the sites of SO₂ uptake by limestone was performed. It was shown that sulfur dioxide was taken up almost completely by the matrix material and that uptake was very dependent on the humidity of the carrier air.

387. Spedding, D. J., Rowlands, R. P.

Sorption of sulphur dioxide by indoor surfaces, I: Wallpapers.

J. APPL. CHEM. 20: 143-146, 1970.

ABSTRACT: In certain instances, indoor concentrations of sulfur dioxide (SO₂) are as low as 20 percent of that prevailing outdoors. These authors suggested that the decreased indoor levels of SO₂ were due to SO₂ sorption by wallpapers, flooring, and fabrics. In this study, the sorption of SO₂ by PVC (polyvinyl chloride) wallcoverings and conventional wallpaper was measured at maximum SO₂ concentrations of 150 micrograms/cubic meter. Surface finish and design patterns of wallpapers affected the sorption rate. Sweat deposits on the samples also influenced the pattern of uptake. In all cases, the conventional wallcoverings showed a greater uptake than did PVC wallpaper.

388. Spedding, D. J.

Sorption of sulphur dioxide by indoor surfaces, II: Wood.

J. APPL. CHEM. 20: 226-228, 1970.

ABSTRACT: Observed low SO₂ concentrations could be due, in part, to SO₂ uptake by certain materials in the residence. This paper investigates the sorption of sulfur dioxide by untreated wood samples of SO₂ concentrations of 90 micrograms/cubic meter. The soft woods uptake was less than that of the hardwoods, and the sites of sorption were different in each class. Most of the sorbed SO₂ was found in the outermost 0.05 millimeter of each sample; a large portion of it was water-soluble. Also discussed is the possible role of SO₂ in the weathering of woods.

389. Spedding, D. J., Rowlands, R. P., Taylor, J. E.

Sorption of sulphur dioxide by indoor surfaces, III: Leather.

J. APPL. CHEM. 21: 68-70, 1971.

ABSTRACT: This is the third paper in a series dealing with SO₂ uptake by certain

household materials. It describes the sorption of sulfur dioxide by leather. Because leather consists of animal fibers, it contrasts with the materials previously studied. The sorption of sulfur dioxide by a wide range of leather samples has been investigated at a concentration of approximately 100 micrograms/cubic meter using sulfur-35 dioxide. In general, the sulfur dioxide was sorbed evenly over the leather surface, the sorbed sulfur being water-soluble. The position on the hide from which the leather was taken had no significant effect on the amount of sulfur dioxide sorbed. The total uptake of the gas was reduced by the application of a finish or by dyeing. The penetration of sulfur dioxide into the samples was influenced by the nature of the organic retanning process used, condensed tanning leading primarily to surface sorption. Leather greases were also shown to reduce penetration of sulfur dioxide. Some implications of these results in the degradation of leathers by atmospheric sulfur dioxide are discussed.

390. Speizer, F. E., Bishop, Y., Ferris, B. G.

An epidemiologic approach to the study of the health effects of air pollution.

PROCEEDINGS OF THE 4TH SYMPOSIUM ON STATISTICS IN THE ENVIRONMENT., 1976.

ABSTRACT: A general description of the 6-city project undertaken by researchers at Harvard University, an epidemiologic approach to a study of the health effects of air pollutants, is given in this paper. The study is designed to determine the effects of known exposure levels in general environmental situations on the respiratory tract in terms of chronicity of respiratory symptoms and changes in pulmonary function. The problems of assessing the exposure-measurement in the ambient environment and of assessing the health effects are dealt with in this program. Environmental exposure is measured at three levels: central station monitoring, indoor-outdoor monitoring, and personnel monitoring. These observed levels are then related to the observed rate of decline in pulmonary function in adults and the rate of increase in pulmonary function in children.

391. Spensler, J. D., Stone, K. R., Lilley, F. W.

High carbon monoxide levels measured in enclosed skating rinks.

J. AIR POLLUT. CONTROL ASSOC. 28(8): 776-779, 1978.

ABSTRACT: Carbon monoxide (CO) levels were measured in enclosed skating rinks in the Boston area. The 1-hr National Ambient Air Quality Standard of 35 ppm was exceeded in 82 percent of the sampled hours. In a separate study, alveolar breath samples were taken of 12 Harvard hockey players, indicating a fivefold increase in carboxyhemoglobin levels after 93 minutes of exercise in air with a relatively low 25 ppm CO concentration. This paper demonstrates that exercising athletes are incurring physiologically dangerous levels of carboxyhemoglobin when performing in legal ambient air concentrations of CO--25 ppm, and concentrations of the poisonous gas in many indoor skating rinks regularly exceed the national ambient standards by as much as 300 percent. It is suggested that the Clean Air Act should be amended to include indoor public exposure to at least the criteria pollutants of carbon monoxide, sulfur dioxide, nitrogen dioxide, and suspended particulates. The U.S. Environmental Protection Agency should require revisions in State Implementation Plans to ensure state responsibility for public air pollution exposures indoors. Finally, it is suggested that rink maintenance machinery be redesigned to reduce noxious output by shifting to electrical motors, by upgrading pollution control equipment, or by routine use of ventilation equipment.

392. Spitz, H. B., Wrenn, M. E., Lowder, W. M. (ed.)

The diurnal variation of the radon-222 concentration in residential structures in Grand Junction, Colorado. HASL-287

SECOND WORKSHOP ON THE NATURAL RADIATION ENVIRONMENT, 1974.

ABSTRACT: The literature contains a wealth of information concerning the concentration of Rn-222 in dwellings. A convenient summary table, available in the most recent report of the United Nations Scientific Committee on the Effects of Atomic Radiation, shows that in the United States some typical values of indoor radon concentrations range from 0.05 pCi/liter to 1.40 pCi/liter. In the same report, two values for outdoor radon concentrations are given as 0.13 pCi/liter and 0.05 pCi/liter. A significant amount of data has been accumulated concerning the radon content of the air within various types of structures. Also included is a table summarizing numerous authors' results for radon concentrations in all parts of the world. This report presents the

393. Sterling, T. D., Kobayashi, D. M.

Exposure to pollutants in enclosed "living spaces."

ENVIRON. RES. 13(1): 1-35, 02/--/77.

ABSTRACT: Pollution of domestic premises, public buildings, and transport vehicles is linked by problems peculiar to enclosures. Enclosures afford protection from toxic substances. On the other hand, they may entrap pollutants inside that have seeped in from the outside or have been generated inside, as enclosed spaces almost always contain sources of pollution of their own. Studies on enclosed environments are grouped for our purposes into four categories. Each category will be discussed separately: pollutants in artificially-sealed environments, pollutants in domestic premises, pollutants in public buildings, and pollutants in transportation-related enclosures. Pollution levels reported by different studies are summarized in a series of appended tables. The information available about pollution in enclosed spaces is sparse but sufficient to indicate the magnitude of possible exposure to inhabitants. Evaluation of existing studies leads inevitably to one conclusion: A building does not protect its inhabitants from pollution. To the contrary. The body burden of toxic vapors and dusts in the "inside" may very well exceed the burden of pollution in the "outside."

394. Stewart, R. D., Hake, C. L.

Paint remover hazard.

J. AM. MED. ASSOC. 235: 398-401, 1976.

ABSTRACT: Recent research has shown that the main ingredient in most paint removers, methylene chloride (dichloromethane, CH₂Cl₂) is metabolized to carbon monoxide. Carbon monoxide is formed in the body as a direct result of the amount of CH₂Cl₂ absorbed during the paint-stripping operation, and this is sufficient to produce substantial stress on the cardiovascular system. In contrast to the usual patterns of carboxyhemoglobin (COHb) formation, the COHb level in those exposed to paint remover vapors increased steadily for several hours following exposure, doubling the duration of cardiovascular stress produced by comparable COHb level after exposure to CO. The effect of CH₂Cl₂ and methanol concentrations under varying ventilation rates was also studied. It was found that the higher the ventilation rate, the less the breathing zone concentrations of the two solvents.

395. Stolwijk, J. A. J.

Draft final report of the Working Group on Health Aspects Related to Indoor Air Quality. ICP/RCE 304(1) 49 P., 07/--/79.

ABSTRACT: The Working Group identified a number of pollutants released by indoor sources to the indoor air. These ranged from pollutants emitted by building materials or contents such as formaldehyde from chip board and foamed insulation to radon emanating from the soil or from building materials to asbestos fibres released by some asbestos containing materials. The Working Group also considered NO_x, CO, CO₂, water vapour and particulates produced indoors by human physiological processes or through the use of unvented gas burning appliances.

396. Stone, R. L.

Fireplace operation depends upon good chimney design.

ASHRAE J., 02/--/69.

ABSTRACT: Gases generated by combustion or other heat sources, such as a fireplace, must be carried out of the residence through the gravity chimney or vent system. These systems must function properly; otherwise, a possibility exists for a hazardous buildup of gases. This article provides an explanation of fireplace function. The author also presents a rational mathematical approach founded on simple fluid flow laws to provide fireplace builders with empirical rules for sound design.

397. Strunin, L., Strunin, J. M., Mallios, C. C.

Atmospheric pollution with halothane during outpatient dental anaesthesia.

BRI. MED. J. 4: 459-460, 1973.

ABSTRACT: This paper deals with the exposure of dentists and patients to halothane, an anaesthetic agent. Halothane is a commonly measured contaminant with typical levels in the range of 10 to 15 ppm. This study shows that the anaesthetist and dental surgeon are exposed to high concentrations of halothane in the indoor atmosphere during surgical procedures utilizing general anaesthesia. Concentrations at the dental surgeon's level were found to range between 18.5 and 73.77 ppm. Scavenging devices reduced levels significantly, but concentrations still remained relatively high. It is interesting to note that the room air-changing system and a local fan had little effect on the level of contamination. At present, however, no definite evidence indicates that exposure to low levels of volatile anaesthetic is harmful.

398. Svensson, A.

Study of ward ventilation in the building research laboratory.

ABSTRACT: The Swedish Building Research Institute's laboratory for climatic-technical installations in Fisksjoens has tested various types of ventilation system for four-bedded patient rooms for 18 months. The types tested were: (i) ceiling inlets and doorway and window extraction, with regulation of room temperature by thermostatically-controlled after-heating of the incoming air, (ii) a two-channel system, with inlets at the windowsill and extraction over the door, (iii) another two-channel type, with ceiling inlets, extraction over the door and window-level convectors. Of the 10 systems tested under (i), only three met the laboratory's requirements, and none of those tested under (ii) gave acceptable results. Experiments initiated to investigate the factors affecting air flow speeds and gradients revealed that very small temperature changes (2 (sup)(o)C.) in the incoming air or in the room bring about large differences in the values under investigation, stressing the need for great care and thoroughness in the design of any research program. The results are presented in a series of graphs; three plans of the rooms are included.

399. Swanton, J. R.

Methods for improving air quality in air-conditioned spaces.

ASHRAE J. 124: 60-61, 1973.

ABSTRACT: The objective of this study was to determine the effectiveness of typical air conditioning systems in removing certain air pollutants from indoor air in office buildings, libraries, banks, and similar structures. The major effort discussed in this work is the removal of sulfur dioxide (SO₂) by use of scrubbers, washers, and charcoal. Tests were performed under actual conditions of use and under laboratory controlled pollutant levels. Some of the results of over 50 runs conducted at a test area in Cambridge, Massachusetts, are as follows: (1) A closed office space maintained levels of SO₂ at about 75 percent of that contained in the supply air. (2) A capillary cell air washer removed 60 to 80 percent of the SO₂ fed into it. (3) Activated charcoal, single pass at 1.8 ppm feed, removed 89 percent of the SO₂ initially, and 82 percent after 3 days.

400. Swift, J. J., Hardin, J. M., Calley, H. W.

Assessment of potential radiological impact of airborne releases and direct gamma radiation from inactive uranium tailings piles., 1976.

ABSTRACT: As part of a program to determine effective measures for control of radioactivity from tailings piles at inactive uranium mills, the U.S. Environmental Protection Agency has prepared estimates of the potential for exposure to the radioactive piles. The gamma radiation field and the radon-222 release rate are estimated on the basis of the radium-226 concentration in each pile. Potential exposures to airborne particulate uranium, thorium-230, and radium-226 are estimated from field measurements. Dispersion of airborne material was circulated with adaptations of computer codes which use common models for annual-average and single-plume dispersion. The estimated potential annual dose from

radioactive radon decay products to individuals in dwellings in the vicinity of an average inactive pile is approximately 8 rem to the tracheobronchial region of the lungs at about 50 meters from the pile, 0.3 rem at 1 kilometer, and 0.1 rem at about 2.2 kilometers. The corresponding doses to the pulmonary region of the lungs from airborne uranium, thorium-230, and radium-226 are estimated to be about one-third as large, within one kilometer of the pile. Gamma exposure rates on the tailings are up to 10 R per year. Estimated exposure rates are in reasonable agreement with the limited data from field measurements. Although there are uncertainties in these estimates, the indicated conclusions are that the radon releases, which are difficult to control, are the hazard of greatest significance, that the radioactive particulate releases may sometimes be significant also, and that thorough measurements are needed for assessment of individual piles.

401. Sydor, R., Pietrzyk, D.J.

Comparison of porous copolymers and related adsorbents for the stripping of low molecular weight compounds from a flowing air stream.

ANAL. CHEM. 50(13): 1842-1847, 11/—/78.

ABSTRACT: Retention of low molecular weight organic compounds varying widely in polarity was determined on commercially available porous copolymers (XAD-2, XAD-4, XAD-7, Tenax GC, Porapak P, and Porapak Q), silica gel, alumina, and activated carbon. The sorbent was packed into a collection tube and air, doped with the model compound, passed through it at a known, controlled concentration and flow rate. Breakthrough was followed by a flame ionization detector (FID). The sorbent capacity was calculated from the weight change of the tube and breakthrough data. Overall capacity increased in the order Tenax GC .aeq. XAD-1 .lt. Porapak P .mlt. XAD-2 .lt. Porapak Q .lt. XAD-7 .lt. XAD-4. Thermal stripping was used to remove the model compounds and desorption was monitored by the FID and by the weight change of the tube. These studies were compared to sorption-desorption data obtained by a batch equilibrium method. Adsorption isotherms and the effects of particle size, column length, flow rate, column reuse, coelution of water, and the coelution of organic compounds were determined.

402. Szelejewska, I.

Spectrophotometric determination of formaldehyde in the presence of acrolein.

CHEM. ANAL. (WARSAW) 20(2): 325-330, 1975.

403. Tabershaw, I. R., Gaudette, L. E., Doyle, H. N., Tabershaw Occupational Medical Associates, P.A. 6110 Executive Boulevard. Rockville MD 20852.

A review of formaldehyde as an environmental product of U-F resins foams. 17 p.

ABSTRACT: In recent months considerable controversy has been generated in regard to potential hazards associated with exposure to formaldehyde from various sources. There is no attempt at this time to disclaim this possibility for some people under specific conditions of exposure. However, the absence of solid evidence relative to the pharmacological, toxicological and physiological effects of formaldehyde has resulted in judgmental conclusions based on insufficient evidence. Based on these conclusions, courses of action to resolve the problem are under consideration which are unjustified and could have far reaching untoward economic effects. In this review attention is addressed to the scientific information available in regard to adverse health effects of formaldehyde exposure, and an effort is made to place the nature and scope of the problem in a less biased perspective.

404. Tanaka, T.

Chromatographic characterization of porous polymer adsorbents in a trapping column for trace organic vapor pollutants in air.

J. CHROMATOGR. 153(1): 7-13, 06/01/78.

ABSTRACT: The validity of the extrapolation method generally used for estimating the adsorption capacity of porous polymer adsorbents has been examined for Porapak Q, Tenax GC and Chromosorbs 101, 102 and 103, with halogenated hydrocarbons (Chloroform, carbon

tetrachloride and 1,1,1-trichloroethane) as test compounds. Gas chromatographic determination of the retention volumes of these compounds on the polymer stationary phases showed a deviation from the values obtained by the extrapolation method.

405. Tanenbaum, M., Bricker, C. E.

Microdetermination of free formaldehyde.

ANAL. CHEM. 23: 354-357, 1951.

406. Taniguchi, H., Breslin, A. J. (ed)

Radon-222 and its daughters in buildings at Uranium City, Saskatchewan. HASL-325

RADON WORKSHOP, FEBRUARY, 1977., 071-177.

ABSTRACT: In February 1976 officers of the Occupational Health and Safety Division of the Saskatchewan Department of Labour carried out a preliminary radiation survey of the 3 schools in Uranium City. Radon levels up to 15 pCi/liter and radon daughter levels of 0.04 WL were found in the primary schools. Levels comparable to background were measured in the intermediate school. In the high school, however, a radon concentration of 173 pCi/liter and a radon daughter level of 0.43 WL were observed. These high levels of radon and its daughters were able to accumulate throughout the high school because the ventilation system had been totally shut down pending repairs. In addition, spot checks were made in a random selection of homes. These preliminary results showed that many of the private homes also had elevated radon levels. As there appeared to be no direct correlation with gamma radiation measurements and no history of the use of uranium mill tailings, it was decided to carry out a complete survey of all of the homes and buildings for radon and its daughters. The procedures used and the results obtained are briefly presented in this article.

407. Taylor, C. G.

The loss of mercury from fungicidal paints.

J. APPL. CHEM. 15: 232-236, 1965.

ABSTRACT: Reports have indicated that the use of mercury compounds as fungicides in paints may lead to poisonings of persons spending long periods in proximity to these paints. The loss of mercury from a typical fungicidal paint has been measured over a 3-month period by a radioactive tracer technique. Results indicate that, although loss occurs, its rate is not likely to cause a concentration of mercury greater than the maximum acceptable level for adult exposure in a normal-sized, adequately ventilated room.

408. Taylor, G. J., Harris, W. S.

Cardiac toxicity of aerosol propellants.

J. AM. MED. ASSOC. 214(1): 81-85, 1970.

ABSTRACT: Aerosol propellants, fluoroalkane gases, were found to be toxic to the hearts of 34 mice, sensitizing them to asphyxia-induced sinus brachycardia, atrioventricular block, and T-wave depression. This also occurred in rats and dogs. In humans, the cardiac toxicity of aerosol propellants may be a cause of death in youths who "turn on" by inhaling such propellants and in patients with asthma who make excessive use of bronchodilator aerosols. Because millions of people use aerosol dispensers in the home for cosmetic, household and other purposes, fluoroalkane gas propellants are released into the air they breathe. The present study shows that deodorant and other cosmetic sprays and various household aerosols sensitize the hearts of mice. If these products are potentially toxic to the human heart, studies are urgently needed to determine the amounts of propellant gases a person is exposed to daily so that indoor levels of aerosol propellants can be controlled.

409. Thompson, C. R.

Measurement of total oxidant levels at Riverside Community Hospital.

ARCH. ENVIRON. HEALTH 22: 514-515, 1971.

ABSTRACT: Ozone concentrations have occurred frequently in many areas of the Los Angeles Basin and other polluted areas. This study looks at ozone levels inside a hospital where the stress of pollutants could prove fatal to intensive care patients. Indoor levels of ozone ranged from 0.15 to 0.26 ppm, while outdoor levels ranged from 0.33 to 0.38. Thus, oxidant levels inside the hospital were 50 to 66 percent of those in the ambient air outside the buildings.

410. Thompson, C. R., Hensel, E. G., Kats, G.

Outdoor-indoor levels of six air pollutants.

J. AIR POLLUT. CONTROL ASSOC. 23(10): 881-886, 1973.

ABSTRACT: Comparisons were made of the levels of six air pollutants--total oxidant, peroxyacetyl nitrate (PAN), nitric oxide, nitrogen dioxide, carbon monoxide, and particulate matter--outside and inside 11 buildings in the South Coast Basin of California during summer and fall. Total oxidant levels inside depend on how much outside air is being brought in and residence time in the structure. With rapid intake and circulation, levels inside may be two-thirds those outside. With little intake and slow circulation, amounts inside decay near zero. PAN is more persistent in buildings because it is more stable than ozone but also decays to low levels over an extended period. Oxides of nitrogen and CO, which are much more stable than oxidants or PAN, remain until diluted or exhausted when carried into buildings. Particulate matter levels indoors depend largely upon velocity of air movement. Indoor areas where foot traffic was light or which had low ventilation rates reduced amounts of particulate. Electrostatic precipitators were much more effective than coarse primary filters used in many buildings for removing particulate matter.

411. Tonomura, T., Tatsuoka, M., Matsuki, K.

Emission of asbestos dust from rotary asbestos heat exchangers and prototype of home-use ventilator incorporating the heat exchanger.

ASHRAE TRANS., 1975.

ABSTRACT: The tests stem from appeals by environmentalists seeking stricter regulations of airborne asbestos dust. An asbestos dust emission test unit was designed to attain emission levels typical of appliances with asbestos heat exchangers of regular specifications. In applying asbestos heat exchangers to home appliances the level of asbestos dust emitted should be carefully considered because of the need for airseals which rub against the moving surfaces of the heat exchangers. Concentrations of asbestos dust were measured at suitable time intervals during continuous runs of the test unit for 1100 hours. The maximum rate of emission for room air volume was 0.42 fibers/liter/minute. Seal spacing, it was found, affected emissivity of asbestos dust more than other factors such as air volume and the number of heat exchanger rotations.

412. Tsang, W., Walker, J. A.

Instrument for the generation of reactive gases.

ANAL. CHEM. 49(1): 13-17, 1977.

413. Tuazon, E. C., Graham, R. A., Winer, A. M., Easton, R. R., Pitts, J. N., Jr., Hanst, P. L.

A kilometer pathlength Fourier-transform infrared system for the study of trace pollutants in ambient and synthetic atmospheres.

ATMOS. ENVIRON. 12(4): 865-875, 1978.

ABSTRACT: A Fourier-transform infrared (FT-i.r.) system operable at pathlengths up to 2 km has been constructed for the detection and measurement of trace contaminants in the ambient atmosphere and in controlled smog formation studies. The long optical path is achieved by the use of an eight-mirror multiple reflection cell with a 22.5-m base path.

The design, construction and use of this novel folded-path optical system are described in detail. In preliminary ambient air measurements at Riverside, California, during the period August-October, 1976, Pb concentrations of formaldehyde, nitric acid, formic acid and ammonia (in addition to O_3 and PAN) were measured in ambient air.

414. Turk, A.

Measurements of odorous vapors in test chambers: Theoretical.

ASHRAE J. 5: 55-58, 1963.

ABSTRACT: Odor test chambers have been described by several investigators. Such chambers are used either for evaluation of odor-reducing devices, or to provide odor-free environments in which a jury can measure the odors of materials, products or foods. In view of these activities, it is important to consider the theoretical possibilities and limitations of measurements of odorous vapors in chambers. Equations that describe specific cases of changing or equilibrium concentrations in closed spaces have been investigated in the past. This paper presents general equations that include both outside and inside sources of vapor addition or deletion, and will consider the role of sensory odor tests in chamber measurements.

415. Turk, A., Mehlman, S., Levine, E.

Comparative odor control performance of activated carbon and permanganated alumina.

ATMOS. ENVIRON. 7: 1139-1148, 1973.

ABSTRACT: Activated carbon and permanganated alumina were compared with regard to their effectiveness in reducing the odor levels of air streams containing olefin, ester, aldehyde, ketone, amine, sulfide, mercaptan, decomposed crustacean shell vapor, or stale tobacco vapor. In all cases, the odor-reducing effect of the activated carbon was much faster than that of the permanganated alumina. For the odors of stale tobacco and decomposed crustacean shells, the permanganated alumina, after it was reduced to MnO_2 , gave evidence of prolonged partial odor reduction, probably by serving as a catalyst for oxidation by air.

416. Urone, P., Ross, R. C.

Pressure change effects on hypodermic needle critical orifice air flow rates.

ENVIRON. SCI. TECHNOL. 13(3): 351-353, 03/--/79.

417. Valentour, J. C., Aggarwal, V., Sunshine, I.

Sensitive gas chromatographic determination of cyanide.

ANAL. CHEM. 46(7): 924-925, 06/--/74.

ABSTRACT: The extreme toxicity of cyanide compels sensitive methods for its detection and determination. Reviews (1, 2) of the methods for the determination of cyanide indicate that numerous approaches are used. Among these, gas chromatography (3, 4) has not been applied successfully to the determination of microgram or submicrogram quantities of cyanide. This paper reports a sensitive gas chromatographic procedure for the determination of cyanide in biological specimens based upon its conversion to cyanogen chloride using chloramine-T (sodium *p*-toluene sulfonchloramide) (5, 6). The cyanogen chloride thus formed is extracted with hexane and injected into a gas chromatograph equipped with an electron capture detector.

418. van den Berg, P. M. J., Cox, T. P. H.

An all-glass sampling device for open tubular columns in gas chromatography.

CHROMATOGRAPHIA 5: 301-305, 1972.

ABSTRACT: An all-glass system for direct sample-introduction of high-boiling

compounds onto open tubular columns is described. The standard deviation for quantitative measurements is less than 2.7%. The loss in resolving power of capillary columns, due to this injection system is negligible. The system is extremely simple and may be connected to any type of gas chromatograph without extensive modifications. The injector appears to be suitable for the analysis of high-boiling compounds, present in trace amounts in volatile solvents. It is applied with success for the analysis of steroids in body fluids.

419. van Turnhout, J., van Bochove, C., van Veldhuizen, G. J.

Electret fibres for high-efficiency filtration of polluted gases.

STAUB-REINHALT. LUFT 36(1): 36-39, 01/--/76.

ABSTRACT: The use of electret filters for the filtration of submicron particles in air is discussed. The filters have an open structure and are made of corona-charged split fibres of polypropylene. They have been tested with NaCl and DOP aerosols and have also been exposed to humid indoor and to industrial air. For a filter weight of 360 grams/square meter, initial efficiencies as high as 99.5% and pressure drops as low as 6 mm H₂O are found at an air velocity of 20 cm/s. Although the electret charges are shielded off by the particles captured, the efficiency only drops by a few percent when the filters are loaded up to 5 weight percent. For solid aerosols, such as NaCl, the change is even less.

420. VandenHeuvel, W. J. A., Gardiner, W. L., Horning, E. C.

Substituted hydrazones as derivatives of ketones in gas chromatography.

J. CHROMATOGR. 18: 391-393, 1965.

421. Versino, B., Knoppel, H., De Groot, M., Peil, A., Poelman, J., Schauenburg, H., Vissers, H., Geiss, F.

Organic micropollutants in air and water: Sampling, gas chromatographic-mass spectrometric analysis and computer identification.

J. CHROMATOGR. 122: 373-388, 07/07/76.

ABSTRACT: Organic micropollutants are sampled by dynamic enrichment on a porous polymer column and subsequently thermally eluted in a flow of helium. The eluted compounds enter gas chromatograph inlet and then pass into two parallel glass capillary columns with different stationary phases, in which they are separated. The separated compounds are detected by gas chromatographic (GC) detectors and by a mass spectrometer that is connected to one or other of the two capillary columns by 'heart cutting' systems. The GC and mass spectrometric (MS) signals are fed via interfaces into a minicomputer which controls the MS scan and performs data acquisition, reduction and treatment on-line and off-line. The resulting GC and MS data are displayed on a line printer or a visual display unit. The minicomputer is connected by a telephone line to an IBM 370/165 computer, where a library search system has been implemented. Some difficulties encountered, data on the sampling recovery of model compounds and the identification of compounds in air and water samples by GC-MS data and library searches are discussed.

422. Vosh, J. W.

Isolation and analysis of carbonyl compounds as oximes.

ANAL. CHEM. 43(12): 1618-1623, 10/--/71.

423. Walker, J. F., Carlisle, P. J.

Trioxane.

CHEM. ENG. NEWS 21(15): 1250-1251, 08/10/43.

424. Wallace, L.

Personal air quality monitors: Past uses and present prospects.

PROCEEDINGS OF THE 4TH JOINT CONFERENCE ON SENSING OF ENVIRONMENTAL POLLUTANTS. 390-394, 1977.

ABSTRACT: Uses of personal air quality monitors in measuring the exposure to air pollution of the general public are explored. Advantages to the epidemiologist and to the environmental manager are described. Studies indicating the desirability, utility, and feasibility of personal monitors are referenced. Present industrial capabilities and Federal agency activities are surveyed. The conclusion is reached that sufficient progress in personal monitor development has been made to warrant evaluation of existing monitors to determine their suitability for environmental studies. It is also concluded that population studies using existing personal monitors could be expected to give valuable information on the exposures of entire urban populations. Finally, for some pollutants not now detectable at ambient levels by personal monitors, increased support for research and development would probably produce working prototypes within three years.

425. Walsh, M., Black, A., Morgan, A.

Sorption of SO₂ by typical indoor sources including wool carpets, wallpaper, and paint.

ATMOS. ENVIRON., 1977.

ABSTRACT: The sorption of sulfur-35, labelled SO₂, by numerous samples of wool carpets, wallpapers, and painted surfaces was measured at a concentration of 100-200 grams/cubic meter. The deposition velocities for carpets ranged from 0.02 to 0.07 centimeters/second and were lower for carpets with an acid pH than for those which were either neutral or alkaline. The sorption of SO₂ appeared to be irreversible. Preexposing carpets to stable SO₂ equivalent to 27 years at 30 grams/cubic meter (a typical indoor concentration) reduced the amount of sulfur dioxide-35 taken up in a subsequent exposure by a factor 3. Fresh emulsion paint had the highest deposition velocity (0.128) and vinyl wallpaper the lowest (0.007) of the other surfaces investigated. There can be no doubt that the lower levels of SO₂ within buildings, compared with simultaneous readings outside, are due to its sorption by furnishings. The most effective sorbing materials likely to be present are cellulose wallpapers, furnishing fabrics, and wool carpets.

426. Wang, T.C.

A study of bioeffluents in a college classroom. 2328 32-40

ABSTRACT: This paper investigates the production of bioeffluents in a 434 seat auditorium, examining the types of compounds found in bioeffluents, the amount of individual compounds, its production during normal lectures, its production during examinations (a stress condition), sex differentiation, and rate of bioeffluent production. High capacity organic vapor collection devices and appropriate sample transfer analysis techniques were applied to sample and analyze organic substances in the air environments of different classes in the auditorium. A conventional liquid scrubbing and chemical analysis was used for inorganic gas determination. Finally, a mathematical model was used to determine the generation rate of bioeffluents and the total amounts of bioeffluents produced.

427. Warner, P. O.

Analysis of substituted hydrocarbons.

ANALYSIS OF AIR POLLUTANTS. 83-84, 1976.

ABSTRACT: Probably the most prominent carbonyl found in ambient air, caused by use of the internal combustion engine as a source of power, is formaldehyde. It is therefore necessary to have on hand a specific test for formaldehyde in addition to a method for determining of total aldehydes. A procedure for measuring formaldehyde using chromotropic acid and a procedure for measuring total aldehydes using MBTH are described.

428. Wartburg, A. F., Axelrod, H. D., Teck, R. J., LaHue, M. D., Lodge, J. P., Jr.

429. Weatherly, M. L.

Air pollution inside the home.

INT. J. AIR WATER POLLUT. 10: 404-409, 1966.

ABSTRACT: Smoke and sulfur dioxide levels were measured inside and outside a building in central London in early 1960. - No significant differences were found between indoor and outdoor levels of smoke when the concentration was below 300 micrograms/cubic meter. However, when the observed concentration was above this level, indoor concentrations were less than outdoors. Since the studied building was far from air-tight, the results appeared unaffected by whether windows were open. Comparisons with other studies show general agreement. Indoor sulfur dioxide levels, always less than corresponding ambient concentrations, averaged 40 percent lower overall. There was no indication that percentage difference increased with outdoor concentrations. As with smoke, indoor levels seemed unaffected by whether the windows were open or closed.

430. Weinberger, W.

A test for aldehydes using dimethylcyclohexanedione.

IND. ENG. CHEM., ANAL. ED. 3(4): 365-366, 10/15/31.

431. West, P. L.

Contaminant dispersion and dilution in a ventilated space.

ASHRAE TRANS. 83, Part 1, 1977.

ABSTRACT: The goals of this research were (a) to characterize the dispersion and dilution of an air contaminant in an enclosed, ventilated space, and (b) to develop a methodology which can be used for studies of contaminant dispersion in laboratories and work spaces with various conditions of ventilation, contaminant release, local exhaust, arrangement of furnishings, and occupancy and personnel activity. A methane gaseous tracer was emitted into a ventilated test room and measurements were made of equilibrium concentrations and rates of decrease in concentrations following the cessation of tracer release. It was found that the ventilation rate can have a statistically significant effect on mixing factor, and that these two factors are inversely related.

432. West, P. W., Sen, B.

Spectrophotometric determination of traces of formaldehyde.

Z. ANAL. CHEM. 153: 177-183

433. West, P. W., Gaeke, G. C.

Fixation of sulfur dioxide as disulfitomercurate (II) and subsequent colorimetric estimation.

ANAL. CHEM. 28(12): 1816-1819, 12/1956.

434. West, P. W., Ramachandran, T. P.

Spectrophotometric determination of nitrate using chromotropic acid.

ANAL. CHIM. ACTA 35(3): 317-324, 1966.

435. West, P. W., Reiszner, K. D.

Personal monitor for nitrogen dioxide. EPA Report No. 600/2-78-001, 1978.

ABSTRACT: An attempt has been made to develop a personal monitor for assaying nitrogen dioxide in ambient air. NO₂ is converted to nitrite and determined colorimetrically. Maintenance of a carefully controlled flow rate is not required because the rate of absorption is controlled by permeation. The monitor which is sealed may be worn in any orientation that does not restrict free air movement to the membrane.

436. Whitnack, G. C.

Single-sweep polarographic techniques useful in micropollution studies of ground and surface waters.

ANAL. CHEM. 47(4): 618-621, 04/--/75.

437. Wilson, K. W.

Fixation of atmospheric carbonyl compounds by sodium bisulphite.

ANAL. CHEM. 30(6): 1127-1129, 06/--/58.

438. Wilson, M. J. G.

Indoor air pollution.

PROC. R. SOC. (LONDON), SER. A 300: 215-221, 1968.

ABSTRACT: A few comparisons of indoor and outdoor pollution were made in this study where the main objective was to alter the situation and observe the effects. Hydrogen chloride (HCl), sulfur dioxide (SO₂), and smoke were liberated in a test room laboratory to give a concentration of about 1 mg/cubic meter. The decay of concentrations during the return to equilibrium was then studied. There was no artificial ventilation in this room; however, windows were included. The rate of air change was measured by liberating helium at the start of the experiment and determining concentrations at intervals with a chromatograph. Half lives corrected for air leakage were: HCl, 7 minutes; SO₂, 40 to 60 minutes; smoke, 145 to 300 minutes. By changing conditions in the room, the half-life and equilibrium concentration of SO₂ could be reduced. The results are compared and found consistent, in general, with published work on pollution in dwellings.

439. Wohlers, H. C., Newstein, H., Daunis, D.

Carbon monoxide and sulphur dioxide absorption on and desorption from glass, plastic and metal tubing.

J. AIR POLLUT. CONTROL ASSOC. 17(11): 753-756, 1967.

ABSTRACT: Characteristics of different tubing materials were investigated as a preliminary step to installing on a television tower 1000 feet of tubing used to transport ambient air samples from different height levels to pollutant monitoring equipment at ground level. This paper describes the results of a feasibility study that determined the sorption characteristics of sulfur dioxide (SO₂) and carbon monoxide (CO) prior to this installation. Studies were performed on samples of glass, Teflon, tygon, polypropylene, PVC piping, aluminum, and stainless steel. The following parameters were investigated: tubing diameter, gas concentration, flowrate, temperature, humidity, and the effect of sorption with SO₂ and CO alone or together. No significant difference between inlet and outlet CO concentrations were found under the conditions of this study. With SO₂ there was only adsorption and desorption for tygon, PVC, and aluminum.

440. Woods, J. E.

Impact of ASHRAE Ventilation Standard 63-73 on energy use.

ABSTRACT: Ventilation rates, as specified in several sets of building codes and standards, have been shown to be conservatively high, often resulting in excessive thermal loads. In addition, if outdoor air quality is poor, these ventilation specifications can have a deleterious effect on the indoor air quality. The new ASHRAE ventilation standard can be used as a basis for controlling the indoor air quality while providing reductions in energy consumption in many cases. Annual energy savings were predicted for a hypothetical ventilation system which maintained the indoor particulate concentration level at no more than half the acceptable outdoor air concentration. This analysis, based on monthly data, indicated that ventilation could be adjusted as a function of outdoor temperature and humidity to maximize energy savings while maintaining acceptable indoor quality.

441. Wyllie, S. G., Alves, S., Filsoof, M., Jennings, W. G.

Headspace sampling: Use and abuse. 15 p.

ABSTRACT: As applied to gas chromatographic sampling methodology, many of us frequently misuse the term "headspace". Most precisely, it should denote that mixture of vapors existing in equilibrium with a sample held in a closed system. Because only the more abundant and more volatile compounds will exist at detectable levels in the small samples that can be used for direct injection, a variety of methods for achieving headspace concentration have been proposed. When the vapor is removed at a rate faster than the equilibrium can be maintained, changes in the relative concentrations of individual components can be expected to occur. Compositional changes can also be engendered by discriminatory trapping; some trapping substrates exhibit lower affinities for specific compounds, and similarly, discrimination can be experienced in the recovery step.

442. Yang, F. J., Brown, A. C., III., Cram, S. P.

Splitless sampling for capillary-column gas chromatography.

J. CHROMATOGR. 158: 91-109, 1978.

ABSTRACT: The experimental aspects of the "Grob splitless" sampling technique are discussed in terms of the sampling time, pulse activation time, solvent type, sample size, column temperature, injector temperature and column flow-rate. Guidelines are developed for using and simplifying splitless sampling. Optimized experimental parameters are given from the results of optimization by simplex. Precision data for retention times and peak areas are shown to be 0.05 and 1%, respectively, for an automated splitless capillary system.

443. Yang, F. J., Brown, A. C. III, Cram, S. P.

Assuring capillary GC column performance by computerized testing.

AM. LAB. 10(8): 57-66., 08/--/78.

ABSTRACT: High resolution glass capillary GC columns, the result of many years of development in glass surface chemistry, permit substantially higher standards of separation capabilities today. The properties, characteristics, and resolving power of glass capillary columns have been described elsewhere. However, the concept of guaranteeing columns on the basis of real-time, high accuracy, computerized testing is new to the field of gas chromatography and is unique to glass capillary columns. The procedures, test criteria, test samples, and computer programs described herein were developed by the authors in the Varian Instrument Division and are used to test all glass capillary columns individually. The performance test criteria and standards applied to these columns are considerably more rigorous than ever attempted with GC packed columns because the high resolution glass capillary columns are inert and have deactivated surfaces. Support effects are minimized by maintaining uniformity of the stationary phase coatings. Thus, the columns can be manufactured with very high and controlled uniformity.

444. Yocom, J. E., Cote, W. A., Clink, W. L.

A study of indoor-outdoor air pollutant relationships, Volumes I & II. NTIS Publication No. PB-195-338 155 p., 1970.

ABSTRACT: In the summer and fall of 1969 and the winter of 1970, suspended particulate matter, soiling particulate matter, carbon monoxide, and sulfur dioxide gases were measured at pairs of older public buildings and new air conditioned office buildings in the Hartford, Connecticut area. Air quality data were obtained for these four pollutants both inside and outside the buildings. Additionally, levels of these pollutants in and around four private homes were also studied in the winter of 1969. Results of the preliminary studies indicated that gas heating systems did not affect indoor carbon monoxide levels, but that gas stoves and attached garages were a significant source of carbon monoxide (CO). Two self-contained and portable instrument packages were constructed for the measurement program which included sampling each pair of buildings simultaneously for a two-week period. It was found that suspended particulate matter readily penetrated the private homes in the summer. Penetration was more on the order of 50 percent in other buildings and other seasons. Carbon monoxide readily penetrates all structures, regardless of season. However, anomalies appear related to sources and ventilation variable, specifically external ventilation. Generally, 50 to 100 percent of the ambient sulfur dioxide levels penetrated the structure, with some loss occurring during penetration. An overall survey of the inside to outside ratios of pollutant concentrations indicates that particulates penetrate the structure least readily but that specific components penetrate more readily or are resuspended inside, that sulfur dioxide suffers some loss during infiltration and that carbon monoxide is least affected by penetration and may be enhanced under certain conditions.

445. Yocom, J. E., Clink, W. L., Cote, W. A.

Indoor/outdoor air quality relationships.

J. AIR POLLUT. CONTROL ASSOC. 21(5): 251-259, 1971.

ABSTRACT: This paper is a condensed report of the study by Yocom, Cote and Clink, "A study of indoor-outdoor air pollutant relationships, Volumes I & II."

446. Yoe, J. H., Reid, L. C.

Determination of formaldehyde with 5,5-dimethylcyclohexanedione-1,3.

IND. ENG. CHEM., ANAL. ED. 13(4): 238-240, 04/15/41.

447. Zeldes, S. G., Horton, A. D.

Trapping and determination of labile compounds in the gas phase of cigarette smoke.

ANAL. CHEM. 50(6): 779-782, 05/--/78.

ABSTRACT: The gas phase of cigarette smoke was trapped and stored on Tenax-GC for subsequent off-site analyses. Specifically, the highly labile compounds isoprene, acetaldehyde, and acrolein were determined quantitatively in the samples which were thermally desorbed in the injector port of a gas chromatograph onto a cooled gas chromatographic column. Optimum conditions were determined for adsorption and desorption of the gas phase, and the effects of aging on the trapped gases were studied.

448. Zlatkis, A., Lichtenstein, H. A., Tishbee, A.

Concentration and analysis of trace volatile organics in gases and biological fluids with new solid adsorbent.

CHROMATOGRAPHIA 6(2): 67-70, 02/--/73.

ABSTRACT: A new procedure for sampling, transfer, and analysis of volatile organic compounds by gas chromatography has been developed. An adsorbent trap ultimately becomes an insert for a modified injector port, and a valve system allows the sample to be transferred to a cooled precolumn and finally to the separating column. Several traps may be used for sampling (for multiple injections), and it has been established that such traps may be stored without loss of sample. The ease and reproducibility of this procedure is amenable for the investigation of volatile organic compounds involving air and water pollution, flavor, and aroma analyses, and body fluid metabolites.

449. Zlatkis, A., Anderson, J. W., Holzer, G.

Concentration and analysis of trace impurities in styrene monomer.

J. CHROMATOGR. 142: 127-129, 1977.

ABSTRACT: Trace levels of impurities in styrene monomer are collected at the exit end of a semi-preparative gas chromatographic column by passing the effluent gas into a tube containing the porous polymer Tenax. The major component, styrene, is not permitted to enter the adsorbent. The concentrated impurities are then thermally desorbed and analyzed by capillary gas chromatography and mass spectrometry. Of the more than 100 peaks present, 60 have been identified.

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