

FORMALDEHYDE: SOURCES, METHODS OF ANALYSIS, EXPOSURE
AND HEALTH EFFECTS

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Characterization. Formaldehyde concentrations of over 1,500 indoor environments (residences and mobile homes) were reported at the Indoor Air '84 Conference. Typical average concentrations varied from below 0.03 ppm to about 0.65 ppm. The distribution was attributed to varying conditions, varying quality of emission rates and varying type of indoor environments.

Sources. Many potential sources were identified. Particle board, urea formaldehyde foam and plywood are the three major sources of indoor formaldehyde. Several methods of measurement of emission rates were discussed. Factors that impact on the emission rates include the quality of the resin bonds, the installation of the source, its age and the temperature on its surface, and the temperature and relative humidity of the indoor environments.

Measurement techniques. Several techniques of measurement were reported. Passive monitors and continuous monitors are used by researchers in the field. Issues raised included the accuracy and precision of the instruments. Comparison studies between passive monitors and continuous monitors have been undertaken, no details were reported on these studies. One is left with the opinion that passive monitors do not always agree with the continuous mode of sampling yet the extent of the difference was not brought forward in the discussion.

Health effects. Discussion on this topic varied from a review of preliminary data from a large Canadian study, to review papers of several epidemiology and animal toxicology studies, to a discussion of chamber experiments where odor threshold values and acute symptoms were investigated. The field study indicated that several symptoms are registered by a portion of occupants on houses with formaldehyde sources. Similar symptoms are reported by an approximately equal portion of occupants of the control sample i.e. houses with low formaldehyde concentrations. A larger segment of the formaldehyde test population reports symptoms but the difference at this stage of investigation is not as pronounced as expected. Carcinogenicity was discussed. It is apparent that animal exposure to formaldehyde leads to cancer. Studies investigating the carcinogenicity of formaldehyde show that formaldehyde is not a potent carcinogen for humans. Public exposure to formaldehyde leads to several irritation, discomfort and other minor health effects.

Considerable discussion was devoted to impacts at low exposures to HCHO but few dealt with impacts at higher levels. Elevated particle concentrations may have a synergistic effect in the presence of formaldehyde.

Mitigation techniques. Only two presentations dealt directly with controls of indoor formaldehyde levels. However, the issue developed into a common theme for discussion. Age reduces the emission rates, source removal has a mitigating effect which, however, is not easy to quantify. Technology is available and is widely used in Europe, less so in USA, to produce presswood that will not become a source of indoor contamination.

Conclusions

1. Elevated formaldehyde concentrations, higher than 100 ppb, are measured in many indoor environments. Formaldehyde concentrations relate positively with temperature and decrease with the age of the source.
2. Urea formaldehyde bonded products can be improved to such a degree that indoor levels can be reduced to ambient levels IF the materials are properly installed and used.
3. Formaldehyde is not a potent carcinogen for humans. Pulmonary functions are similar in control and sample populations. Nasal and skin symptoms are higher in populations exposed to elevated formaldehyde concentrations.

We are now in the post-formaldehyde era. While research on the indoor formaldehyde does not seem to be as urgent as three years ago, research is continuing and several positive, practical results are obtained as a result of several efforts. It is not misleading to claim that the quality of life has improved as a result of research reported in the presentations at the Indoor Air '84 Conference.

References

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