EMANATING POWER OF ^{222}Rn MEASURED IN BUILDING MATERIALS

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1. INTRODUCTION

Utilization of industrial wastes in new building materials technology as well as traditional building materials itself creates some health problems because of natural radioactive elements present in these materials. Special attention should be paid to ^{222}Rn which emanates from the walls to atmosphere of living rooms creating an inhalation hazard to inhabitants. The knowledge of the emanating power of this noble gas makes it possible to estimate this hazard.

2. METHOD

For the estimation of emanation coefficient (emanating power), which is defined as the ratio of migrating ^{222}Rn to the ^{226}Ra content in the sample, the material investigated was placed in an air-tight glass container 22 cm in diameter and 6000 cm^3 in volume (Fig. 1). Radon diffusing from the sample into the air inside the container becomes uniformly distributed in the air volume through the gap in the doubly ground glass plate which divides the container in two parts. The application of this plate made it possible to separate air-radon from the sample-radon while transferring the air sample into the measuring chamber by vacuum technique. The emanation coefficients were estimated for thick samples, the optimal thickness of which was found to be approximately 9 cm. This was assessed by estimating the diffusion factor, which by way of example for power plant fly-ashes amounted to 8.5×10^{-6} $cm^2 s^{-1}$. The estimated diffusion factor proved to be very small compared with the soil, which was found to be approximately 5×10^{-2} $cm^2 s^{-1}$ (1). All samples were granulated and dried at 105°C before placing inside the container and air-radon samples were measured after a minimum of 4 days. Radon was measured in an electrostatically operated cylindrical steel chamber in which alpha-ray scintillations were counted (2). The sensitivity of our measuring system was better than 50 pCi m^{-3}, and this figure could be improved if necessary, being about two orders of magnitude below typical measurement levels.

2. RESULTS

The application of this method permitted the determination of emanation coefficients of various building materials. The main results are shown in Table 1.

Table 1. Emanation coefficients of building materials.

Material	Number of samples	^{226}Ra concentration, pCi/g		Emanation coefficient, %	
		Range	Mean	Range	Mean
Fly-ash	33	1.7 - 3.9	2.6	0.20 - 1.16	0.54
Slag	11	1.0 - 3.6	1.8	0.24 - 1.53	0.70
By-product gypsum	3	0.7 -19.0	11.8	3.5 - 19.7	12.0
Red brick	1		0.54		5.1
Silicon brick	1		0.18		16.3
Portland cement "350"	1		0.65		4.1
Soil	5	0.11-0.51	0.27	12.1-50.1	28.9

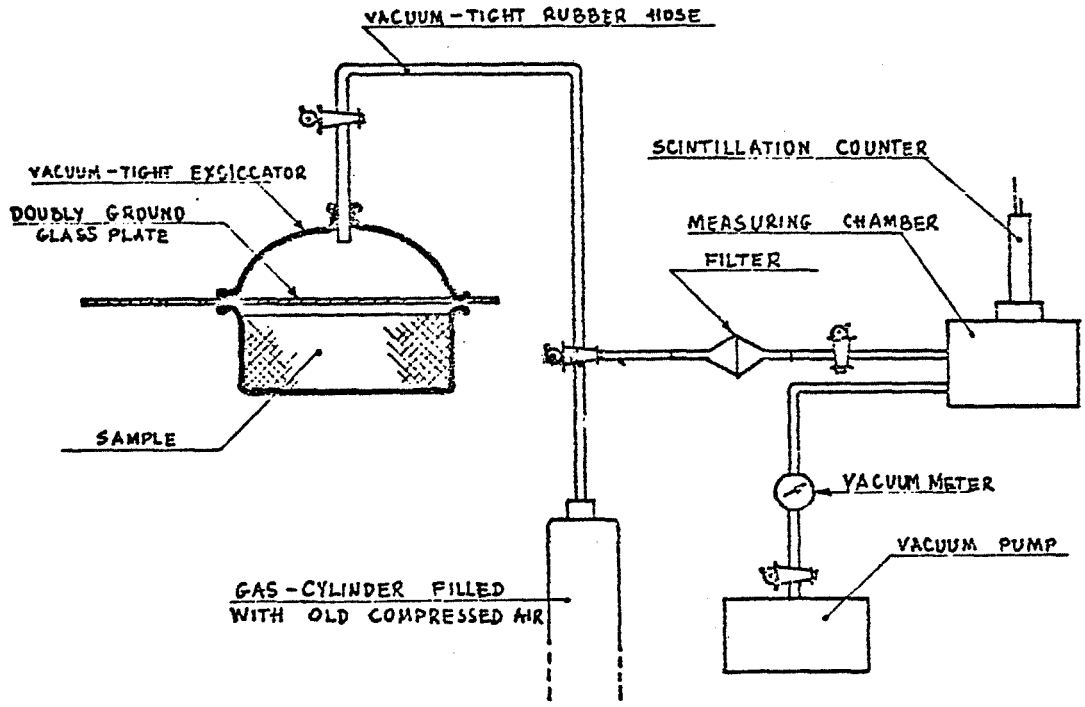

Fig.1. General scheme of measuring equipment.

1 . Serdjukova,A.S., Kapitanov,J.T. "Izotopy radona". Moskva, Atomizdat, 1975.

2 . Wardaszko,T. "Measurement of ^{222}Rn concentration in air by means of electrostatic precipitation of its daughter products". Report No CLOR-47/D, Warszawa, 1966.