METHODS FOR A CONTINUOUS REGISTRATION OF RADON, THOR AND THEIR DECAY PRODUCTS IN- AND OUTDOORS

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For radiation estimations one has to consider especially the higher external and internal radiation inside structures (1-4). Our interest concerns the internal radiation resulting from inhalations of Rn, Tn and their daughters. We study in which way the considerations of Rn, Tn and their decay products are influenced by ventilation, exhalation and outdoor conditions. By model calculations we found that the ventilation of a room and the exhalation of the walls are the dominant factors that influence Rn and Tn concentrations in a room (5).

In a second step we will check this model experimentally. Therefore, we set up devices to measure most of the parameters which influence the activity indoors. In this paper the methods used to measure the concentrations of Rn, Tn and their decay products indoors and outdoors are reported.

Rn and Tn concentrations are detected continuously by collecting the positively charged RaA (^{218}Po) and ThA (^{216}Po) atoms on a surface - barrier detector using electric field precipitation. With an α - resolution of about 100 keV, the separation of the α energies of RaA/ThC (^{212}Bi), ThA, RaC' (^{214}Po) and ThC' (^{212}Po) was possible. The volume of the collecting chamber is ~10 ℓ and the detection limits in a 60 minute counting period are 50 pCi/m^3 for Rn and 200 pCi/m^3 for Tn.

The determination of the Rn- and Tn-decay products concentration was carried out by collecting them on a membrane filter (airflow 3.8 m^3/h) and simultaneously counting the activities by means of a collimated surface-barrier detector (active area: 900 mm^2). The α - resolution about 250 keV is sufficient to separate RaA/ThC, RaC' and ThC'. With an efficiency of 5.9% the limit of detection is 10 pCi/m^3 for RaA, 0.6 pCi/m^3 for RaC/C' and 1 pCi/m^3 for ThC' in a counting period of 60 minutes.

Indoor and outdoor concentrations are registrated simultaneously under different ventilation rates. We measured the air-exchange by filling the room up to 1% CO_2. The slope of the decrease of concentration with time was used to determine the ventilation rates. This device works automatically, which permits a continuous registration of this parameter.

References

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