

Construction Materials and Radon

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Abstract

Current studies have been performed with the aim to find the correlation of radon concentration in the air and used construction materials. At the first stage of the measurements different samples of materials used in civil construction were studied as a source of radon in the air and at the second step it was studied the radon infiltration insulation using different samples of finishing materials.

For ²²²Rn concentration measurements related to different construction materials as well as for the studies of radon emanation and its reduction, the sealed cell chambers, of approximately 60 x 60cm², have been built using the ceramic and concrete blocks. This construction has been performed within protected and isolated laboratory environment to maintain the air humidity and temperature stable. These long term measurements have been performed using polycarbonate alpha track passive detectors. The exposure time was set about 15 days considering previous calibration performed at the Institute of Radiation Protection and Dosimetry (IRD/CNEN), where the efficiency of 70% was obtained for the density of alpha particle tracks about 13.8cm⁻² per exposure day and per kBq/m³ of radon activity concentration. The chemical development of alpha tracks has been achieved by electrochemical etching. The track identification and counting have been done using a code based on the MATLAB Image Processing Toolbox.

The cell chambers have been built following four principle steps: 1) assembling the walls using the blocks and mortar; 2) plaster installation; 3) wall surface finishing using the lime; 4) wall surface insulation by paint.

Making the comparison between three layers installed at the masonry walls from concrete and ceramic blocks, it could be concluded that only wall painting with acrylic varnish attended the expectation and reduced the radon emanation flow by the factor of 2.5 approximately.

Studied construction materials have been submitted the instant measurements of radon concentration using ALPHA GUARD Professional detector. The samples of construction materials were stored inside an acrylic container (sealed up chamber) connected to instant ALPHA GUARD detector. The equipment was adjusted with air flow of 0.5 L/min and ²²²Rn concentration had been registered every 10 minutes. Among analyzed materials were sand, structure concrete blocks, granite and concrete paving stones, cement, etc. Measured instant ²²²Rn concentrations are compared with the results of long term measurements using alpha track detectors.

KEYWORDS: *NORM; Rn-222; Construction Materials; Track Detectors; Alpha Particles.*

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