

Evaluation of Indoor Radon as Air Pollutant in Schools and Control of Exposure of the Children

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Abstract : In recent decades, the general public has become increasingly interested in the impact of air pollutions on their health. Currently, numerous studies are aimed at identifying pollutants in the indoor environment where they carry out daily activities. Internal pollutants can be of both natural and artificial origin. With regard to natural pollutants, special attention is paid to natural radioactivity. In recent years, radon has been one of the most studied indoor pollutants because it has the greatest contribution to human exposure to natural radionuclides. It is a known fact that lung cancer can be caused by radon radiation and it is the second risk factor after smoking for the onset of the disease. The main objective of the study under the National Science Fund of Bulgaria, in the framework of grant No KII-06-H23/1/07.12.2018 is to evaluate the indoor radon as an important air pollutant in school buildings in order to reduce the exposure to children. The measurements were performed in 48 schools located in 55 buildings in one Bulgarian administrative district (Kardjaly). The nuclear track detectors (CR-39) were used for measurements. The arithmetic and geometric means of radon concentrations are $AM = 140 \text{ Bq/m}^3$, and $GM = 117 \text{ Bq/m}^3$ respectively. In 51 school rooms, the radon levels were greater than 200 Bq/m^3 , and in 28 rooms, located in 17 school buildings, it exceeded the national reference level of 300 Bq/m^3 , defined in the Bulgarian ordinance on radiation protection (or 30% of the investigated buildings). The statistically significant difference in the values of radon concentration by municipalities (KW, $p < 0.001$) obtained showed that the most likely reason for the differences between the groups is the geographical location of the buildings and the possible influence of the geological composition. The combined effect of the year of construction (technical condition of the buildings) and the energy efficiency measures was considered. The values of the radon concentration in the buildings where energy efficiency measures have been implemented are higher than those in buildings where they have not been performed. This result confirms the need for investigation of radon levels before conducting the energy efficiency measures in buildings. Corrective measures for reducing the radon levels have been recommended in school buildings with high radon levels in order to decrease the children's exposure.

Keywords : air pollution, indoor radon, children exposure, schools

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