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Characterization of phosphogypsum in three industrial area from Romania

Phosphogypsum is a by-product of chemical processes, resulting from industrial activities, production of fertilizers and detergents. This inorganic waste is then deposited in dumps and stacks, of very large volumes and surfaces that represent a great danger to the environment (air, water, soil) by pollution with chemicals such as fluorides (F⁻), metals and heavy metals, trace elements (Fe, Mn, Pb, Cd, etc.) and radionuclides, where ²²⁶Ra represents the major source of radioactivity in PG wastes [1].

Romania has former chemical industry that in the present is collapsing and places are often left unattended. Three former chemical industry areas have been chosen for this study located in southern Romania: Valea Calugareasca, Navodari and Turnu Magurele, where the atmospheric radon measurements for PG deposits were extensively done (approximately 30 days of measurements).

In order to characterize the radiological impact on population and environment of gyp-stacks and waste dumps, several types of measurements have been made, in situ and in the laboratory, and a radiological evaluation has been accomplished. The main objective of this work was to assess the influence of radon concentration on the surrounding area and natural radionuclides from ²³⁸U and ²³²Th series and ⁴⁰K.

The average radon concentrations in three locations: Valea Calugareasca, Navodari and Turnu Magurele were 21.88 ± 3.19 Bq/m³, 26.56 ± 2.90 Bq/m³ and 33.43 ± 3.64 Bq/m³, respectively. The gamma spectrometry measurements showed that the total activities are 1510.62 ± 148.08 Bq/kg, 1838.77 ± 165.04 Bq/kg, 1363.83 ± 147.96 Bq/kg. The results show in all cases elevated levels of ²²⁶Ra for PG samples, indicating the necessity to find suitable routes to reduce its radiation impact on the surrounding environment [2].

From the point of view of radiation protection, the high radium content of phosphogypsum is significant for the increase of the radon concentration in the surrounding air and radiation hazard associated with it. The gamma spectrometric analyses indicate that the phosphogypsum samples contain ²²⁶Ra, ²¹⁰Pb and small amount of ²³²Th in some samples, while ¹³⁷Cs could not be detected.

Under these circumstances, there are recommended measures for popularizing the potential risks in each area inhabited and local communities living near these waste deposits. Radiological tests and measurements for water and local agricultural products must be carried out in these areas, but also other monitoring programs through which can be found changes of natural radioactivity.

References

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2. M. R. Calin • I. Radulescu • M. A. Calin, Measurement and evaluation of natural radioactivity in phosphogypsum in industrial areas from Romania, *J Radioanal Nucl Chem* 304:1303–1312, (2015)

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