

Session 4: NORM in building materials

Oral presentation

Radiological implications of using phosphogypsum as building material: a case study of Brazil

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Problem formulation

Phosphogypsum, a NORM waste derived from the production of phosphoric acid, is being worldwide stockpiled. The presence of radionuclides in significant concentrations prevents its safe re-use as building material. In order to evaluate the feasibility of using phosphogypsum in the manufacturing of building elements such as bricks and plates, a comprehensive research was undertaken at IPEN, Brazil, following a multiple approach.

Methods/Measurement/Discussion

This research included the radiological characterization of bricks and plates produced with Brazilian phosphogypsum; the evaluation of the radiological impact of its use in dwellers, which comprises the evaluation of internal exposure due to radon inhalation and external exposure due to gamma radiation indoors. An experimental house was built with phosphogypsum plates of different origins. The house was entirely lined with phosphogypsum and designed to perform a comprehensive radiological evaluation, including the modelling of the external dose indoors, measurement of the external gamma exposure and of radon concentrations, allowing the replacement of different internal phosphogypsum plates, as needed for the evaluation.

Conclusion

In this experimental house it was possible to evaluate the dose conversion factors for the external exposure and to evaluate the actual annual increment in the effective dose to an inhabitant of the house for every reasonable scenario. The radon measurements were carried out in order to determine the long-term average levels of the indoor radon concentrations. The results obtained in this study for activity concentrations and radiation doses gave evidence that the use of the Brazilian phosphogypsum as a building material poses no additional health risk to dwellers for the studied scenario, arising from radioactive material present in the material employed in the building. The dose assessment based on a real scenario, where a given material is used in a specific way, provides realistic conclusions that can help in making decisions about the applicability of new materials. The methodology developed in this work can be applied to other studies and building materials by using appropriate adjustments.