Radiological characterization and evaluation of high volume bauxite residue alkali activated concretes

Abstract:
Bauxite residue, also known as red mud, can be used as an aggregate in concrete products. The study involves the radiological characterization of different types of concretes containing bauxite residue from Ukraine. The activity concentrations of radionuclides from the 238U, 232Th decay series and 40K were determined for concrete mixture samples incorporating 30, 40, 50, 60, 75, 85 and 90% (by mass) of bauxite residue using gamma-ray spectrometry with a HPGe detector. The studied bauxite residue can, from a radiological point of view using activity concentration indexes developed by Markkanen, be used in concrete for building materials and in road construction, even in percentages reaching 90% (by mass). However, when also occupational exposure is considered it is recommended to incorporate less than 75% (by mass) of Ukrainian bauxite residue during the construction of buildings in order to keep the dose to workers below the dose criterion used by Radiation Protection (RP) 122 (0.3 mSv/a). Considering RP122 for evaluation of the total effective dose to workers no restrictions are required for the use of the Ukrainian bauxite residue in road construction.

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