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Measurement and monitoring of radioactivity for contaminated land by phosphogypsum-Tunisia

Abstract

The development of the phosphate fertilizer industry leads to the production of more and more phosphoric acid phosphoric acid by attacking natural phosphates with sulfuric acid. The GCT has developed this industry since the beginning of the 1950s, with the obligation to reject significant quantities of phosphogypsum, an unavoidable sterile, at the same time as the acid.

Currently, the Terril of phosphogypsum is stored a total quantity about 30 000 000 tons, a waste by product of the Tunisian company phosphate fertilizer industry, was disposed into phosphogypsum tip in the same site. The storage of phosphogypsum in a slagheap is therefore likely to result in two types of radiological exposure, the impact of which is related to the characteristics of the radioactive elements it contains. The quarry has been recently closed and should be remediated, the all deposited phosphogypsum has been exposed due to intense rainfall, wind and other climatic condition.

This study seeks to assess the environmental impact of the phosphogypsum deposited in the site, using in-situ measurement techniques to measure doses (measured in contact and at a height of 1 meter). The Dose rate varies between 100 and 15300 nSv/h.

The black phosphogypsum samples show that Ra-226 activities can reach more than 10000 Bq/kg; whereas the white phosphogypsum wastes present an average Ra-226 activity of 300 Bq/kg. The maximum activity concentration of 2000 Bq/kg is recorded in a sample at the level of the lower Tabia.

The radiological impact study of the phosphogypsum deposit at the GCT site of the sfax plant leads to the following conclusions: 1- In the current situation, the radiological impact due to the deposit of Phosphogypsum is lower than the reference value of 01 mSv/year (500 nSv/h) with the exception of some places located in the periphery of the slag heap, which require further investigation. 2- During the rehabilitation of the site, the exposure of workers would be less than 01 mSv/year. 3- In the event that a landscape reintegration would be envisaged without administrative, socio-cultural and residential buildings, but with the possibility of installing sports fields with changing rooms residual radiological impact would be less than 01 mSv/year,

4- For the future, if there are houses to be built without specific precautions, in particular to reduce the risk of preferential accumulation of radon.

Keywords: NORM, Gamma ray spectrometry, Radioactivity, phosphogypsum, dose rate

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