

International Conference on the Management of Naturally Occurring Radioactive Materials (NORM) in Industry

VIRTUAL EVENT

International Conference on
**Management of Naturally
Occurring Radioactive
Material (NORM) in Industry**

19–30 October 2020

#NORM2020



Contribution ID: 83

Type: Poster

Uranium, Thorium and Rare Earth Elements in Minjingu Phosphate Rocks, Dispersion in Mine Tailings and Fertilizer Products, Opportunities for Total Resource Recovery

Abstract

Minjingu phosphate rock from Tanzania contains a number of accompanying elements that could be extracted during phosphate fertilizer production. The average uranium concentrations in Minjingu phosphate rocks is averaged at 390 ppm. The Minjingu Mines & Fertilizers Ltd. reports that the annual phosphate production is about 100,000 t. This means that some 39 tons of uranium are mined as an accompanying element at the Minjingu mine each year. In addition to uranium, Minjingu phosphate rock contains a significant concentration of rare earth elements. The average rare earth elements (REEs) concentrations above 500 ppm were measured in 10 Minjingu phosphate rock layers, 4 Minjingu mine tailing and 5 presently produced Minjingu fertilizer products (fertilizer powder, fertilizer granules, Mazao, Nafaka and Top Dressing). In addition, a new innovative process for U and REEs removal from Minjingu phosphate rock was developed and successfully tested on laboratory scale.

This paper presents the concentrations of uranium and rare earth elements present in the phosphate rock, mine tailing and the fertilizers. Two issues are discussed, first uranium and REEs as resources lost by spreading in agricultural soils and secondly U as an environmental contaminant. The paper further discusses the competing need of food security sustained by dependence of the only one commercially available phosphate fertilizer factory and clean environment. They are both equally important, an equilibrium can be attained by deploying an innovative technology for recovery of U and REEs.

Keywords: Minjingu Phosphate Rocks, mine tailing, Phosphate Fertilizers, innovative technology

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Session Classification: Special Session on Emerging Issues

Track Classification: Emerging Issues on NORM