

DISTRIBUTION OF NATURAL RADIONUCLIDES AND RARE EARTH ELEMENTS IN THE PRODUCTION AND USE OF PHOSPHATE FERTILIZERS IN BRAZIL**SAUEIA C.H.R., MAZZILLI B.P. & FÁVARO D.I.T.**

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The Brazilian phosphate fertilizer is obtained by wet reaction of igneous phosphate rock with concentrated sulphuric acid, giving as final product phosphoric acid and dihydrate calcium sulphate or phosphogypsum as by-product. Phosphoric acid is the starting material for triple superphosphate (TSP), single superphosphate (SSP), monoammonium phosphate (MAP) and diammonium phosphate (DAP). The phosphate rock used as raw material is enriched in radionuclides of the U and Th natural series. Taking this into account, the main aim of this paper is: to evaluate the fluxes of natural radionuclides and radioactive disequilibria involved in the industrial process of phosphoric acid production, and from these data to estimate the radioactivity released annually to the environment by this industrial complex; and to determine the content of radioactivity in several commercial fertilizers produced by this industry, in order to estimate their radiological impact in crop soils. Radiological and elemental characterization of phosphate rock, phosphogypsum and phosphate fertilizers was performed by instrumental neutron activation analysis and by gamma spectrometry. The fertilizers samples which are derived directly from phosphoric acid, MAP and DAP, presented in its composition low activity concentrations for Ra-226, Ra-228 and Pb-210. As for U and Th, the concentrations found in MAP and DAP are more significant, up to 374 and 250 Bq/kg respectively. SSP and TSP, which are obtained by mixing phosphoric acid with different amounts of phosphate rock, presented higher concentrations of radionuclides, up to 409 Bq/kg for U-238, 871 Bq/kg for Ra-226, 1255 Bq/kg for Pb-210, 722 Bq/kg for Th-232 and 717 Bq/kg for Ra-228. From the results obtained for the radiological characterization of Brazilian phosphate fertilizers and the application of a single model, it was concluded that the dilution factor is high and, therefore, no environmental radiological impact can be predicted from this practice

10040