

high-resolution gamma spectrometry. Radionuclides concentration in the phosphate rock and phosphogypsum presented the same pattern for Ra-226, Pb-210 and Ra-228, ranging from 53 to 723 Bq/kg. Fertilizer samples, which are derived directly from phosphoric acid, MAP and DAP, presented in its composition activities concentrations below the detection limits of the counting system. SSP, TSP and NPK, which are obtained by mixing phosphoric acid with different amounts of phosphate rock and NH<sub>3</sub>, presented higher concentrations of radionuclides, up to 871 Bq/kg for Ra-226 and 278 Bq/kg for Ra-228.

**253 DETERMINATION OF U AND Th DECAY SERIES AND RARE EARTH ELEMENTS IN SEDIMENTS IN AN AREA AFFECTED BY PHOSPHATE FERTILIZER PLANTS.** P.S.C. Silva<sup>1</sup>; B.P. Mazzilli<sup>1\*</sup> and D.I.T. Favaro<sup>2</sup>. <sup>1</sup>Laboratório de Radiometria Ambiental. <sup>2</sup>Laboratório de Análise por Ativação Neutrônica. Instituto de Pesquisas Energéticas e Nucleares, Caixa Postal 11049, São Paulo, BRAZIL

In the last decades considerable attention has been given to technologically enhanced natural occurring radioactive material (TENORM). Within this frame, of particular concern is the phosphate fertilizer industry. Santos Basin, located in Southwest Brazil, São Paulo State, comprising the counties of Santos, São Vicente and Cubatão, is considered the most important industrial region of the country. Among the industrial activities present, phosphate fertilizer plants are responsible for the production of 69 millions tons of phosphogypsum waste, which is stockpiled in the surrounding environment. This waste concentrates radionuclides of the natural series as well as rare earth elements originally present in the phosphate rock used as raw material. This study aims to evaluate the environmental impact of such activities in the sediments of the estuarine system. U, Th and rare earth elements La, Ce, Nd, Sm, Eu, Tb, Yb and Lu were determined by neutron activation analysis. Radionuclides <sup>226</sup>Ra, <sup>228</sup>Ra, <sup>228</sup>Th and <sup>210</sup>Pb were determined by gamma spectrometry. The results were analysed using normalization with PAAS and the baseline concentrations obtained from the sediments collected in depth. Cluster analysis and principal component analysis were also used for data interpretation. In the vicinity of fertilizer plants, a strong correlation was observed between sediments concentration and antropic activities.

**254 SELECTED TRACE AND MINOR ELEMENTS IN SOFT ROCKS FROM ASUNCION AREA -** J.F.Facetti-Masulli<sup>1</sup>, P.Kump<sup>2</sup>, J.J.Bosio<sup>3</sup>. <sup>1</sup>Hydroconsult SRL-De Gaulle 980-Asunción-Paraguay - <sup>2</sup>J. Stefan Institute -1000 Ljubljana, Jamova 39, Slovenia - <sup>3</sup>. Facultad de Ingeniería -Universidad Católica - Asunción -PARAGUAY.

Soft-rocks from Asuncion area were investigated with XRF techniques. Such rocks occur widespread, are the main bedrock of the area, and are of unknown age. On the other hand magmatic rocks, represented by nephelinite/ankaratrite, occur in several plugs, flows, etc, bearing mantle xenoliths of spinel periodotite; they were subjected recently to excellent geochemical studies and useful data are available. These outcrops belong to Tertiary alkaline magmatism of the so called Central Alkaline Province of Paraguay; their ages are around 41 to 48 Ma. Selected trace elements analyzed in soft-rocks were Zr-Nb-Ba-La-Ce-Nd using an Am-241 source whereas Ti, Mn, Fe, which are very often correlated with the above elements, using a Mo tube. The analysis of complex spectra was performed by the AXIL software, and the quantitative analysis, by the QAES software. REE are considered as useful indicators of geochemical processes, and in this case, of provenance. Usually they maintain their primary relation and are transferred almost directly into sediments. Their values here found, absolute and normalized, are well correlated to those of the magmatic rocks, ie, the former are derived from the latter. Thus, the higher limit of their age can be estimated.

**255 INAA FOR THE CHEMICAL CHARACTERIZATION OF FULL SUN- AND SHADED-ORGANIC COFFEE SYSTEMS.** C. F. Moreira\*, E. A. De Nadai Fernandes. University of Sao Paulo, Nuclear Energy Center for Agriculture (CENA), Piracicaba, SP, BRAZIL

The consumption of special coffee, mainly organic coffee, is increasing worldwide. Brazil is the largest world coffee producer, with 2,700,000 tons of green coffee in the 2002 harvest. However, only 4,200 tons are