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Natural Radiation and Environmental Applications

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Naturally occurring radioactive materials (NORM) are continuous and an unavoidable feature of life on Earth and are present in its crust since its origin. The irradiation of the human body from external terrestrial sources is mainly due to gamma rays coming from natural radionuclides, such as 40K and the elements of the series of 238U and 232Th. These primordial radionuclides present long half-lives, decaying to achieve stability, producing ionizing radiation. It is very important to study radionuclide distribution in soils to understand the radiological implications in relation to the exposure of the human body to ionizing radiation and the knowledge of which components are found in one specific geographic region. Natural background radiation studies are needed to establish reference levels, especially in areas where the risk of radioactive exposure may be higher, and this risk index can be worsened through the soil mineral extraction, generating Technologically Enhanced Naturally Occurring Radioactive Material (TENORM). On the other hand, the secondary effects of natural radiation are also of extreme importance, since the human being feeds on animals and plants, which determine the intake of natural radionuclides. In this work the distribution of natural radiation from Southeastern Brazilian beach sands using gamma-ray spectrometry was studied. In most of the samples studied the dose due to external exposure to gamma-rays, proceeding from natural terrestrial elements, are within the values 0.3 and 1.0 mSv/year, typical range indicated by the United Nations Scientific Committee on the Effects of Atomic Radiation. Gamma-ray technique was used to evaluate the transfer rate of these radionuclides from soil to the plants. Energy-Dispersive X-Ray Spectroscopy (EDS) microanalysis and X-Ray Fluorescence were used also to assist in the sample analysis. The study of natural radiation present in TENORM, plants and food was done. Various chemical processes have been applied in TENORM considering waste samples from extraction of phosphatic rocks, in order to make viable the extraction process and reducing the amount of radioactive waste

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