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Radionuclides' Content Speciation and Fingerprinting of Nigerian Tin Mining Tailings

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Sediment and process-waste samples rich in cassiterite, monazite and zircon, which are of industrial interest, were analysed for the natural series radionuclides, 232Th and 238U and the non-series radionuclide, 40K using instrumental neutron activation analysis (INAA) technique. The natural radionuclides' radioactivity in the samples from the tin-rich areas of Jos, Nigeria was determined using K0–INAA. The obtained results have a high degree of reliability judging from the technique′s accuracy, precision and its non-dependence on secular equilibrium and density correction problems inherent in gamma spectrometry as well as rigorous contamination-prone sample preparation requirements of other methods. Radionuclides speciation and ratios, giving radionuclide fingerprinting of the tin mining tailings is reported. The measured radionuclides activity levels are several orders of magnitude higher than UNSCEAR reference values, revealing the pollution potential of the tin mining and process activities on the surrounding areas, vis-à-vis heavy particulate matter load, leaching into various water channels and direct exposure to gamma rays emitted from the houses and facilities built from the generated wastes. The observed activity levels reflects possible worst scenario situation and the data would not only be of use to the government in its remediation plan for the study area but will also serve as important information for the nuclear science and technology programme about to be embarked upon. Methods of checking exposure have also been suggested.