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Analysis of UOC for nuclear forensics fingerprinting using Scanning Electron Microscope

Nuclear forensics involves the analysis of nuclear material for possible provenance determination using various analytical tools that are available for such analysis. In this study, Scanning Electron Microscopy (SEM) combined with Electron Dispersion Spectrometer (EDS), were used to determine the signatures of uranium ore concentrates (UOC) samples for nuclear forensic applications. SEM and SEM / EDS provided substantial information on this UOC's morphology and elemental composition. Distinct qualitative and quantitative difference are present for the different UOC's. The UOC's surface consists of agglomeration made up of homogenous spherical particles, irregular shaped particles and plate like bulky particles. Average particle size ranged between 0.1 −0.2 μm. EDS analysis of all the samples showed they contained a consistent 70 weight % of uranium and a stoichiometric formula closest to the molecule of UO4. This technique can thus be used to distinguishing and fingerprinting UOC's originating from different mines in South Africa.

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