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Investigation of the Rare Earth Elements Pattern for uranium attribution in nuclear forensics environment

Illicit trafficking of radioactive material and especially nuclear material (thorium, uranium, and plutonium) has been an issue of concern since the beginning of the 1990s, when the first seizures of nuclear material were reported to the International Atomic Energy Agency. In this work, twenty samples selected for investigation originate from South Africa and Namibia uranium mines. The aim of this study was to determine whether the lanthanides patterns measured in a particular sample can be used to attribute the uranium sample to the production or reprocessing plant. Measurements were carried out using an inductively coupled plasma mass spectrometer (ICP-MS) NexION 2000. The results for the Namibian mine show the REEs exhibit light REE-enriched patterns with pronounced positive Ce anomaly when normalized to chondrite which indicates that the REEs are taken up in proportion to their relative concentration in the source rocks. While for the South African mine, the REEs exhibit heavy REE-enriched patterns with pronounced positive Tb anomaly when normalized to chondrite. These results confirm that, REE patterns used for origin location do reflect significant variation within mine and thus provide valuable information about the geochemical formation and origin.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

Primary author: Mr KUPI, Tebogo (North-West University)

Co-author: Prof. MATHUTHU, Manny (North-West University)

Presenter: Mr KUPI, Tebogo (North-West University)

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