Redistribution of REE in association with formation of secondary uranium minerals

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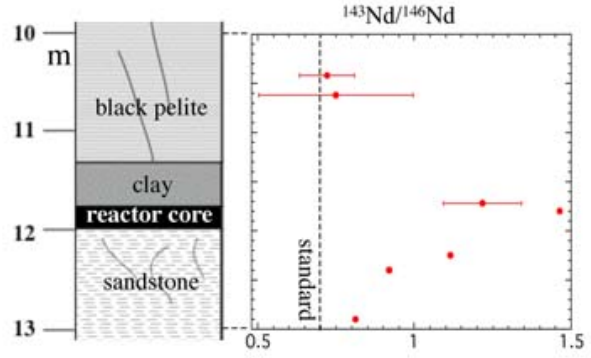
The Oklo-Okelobond-Bangombé uranium deposits, the Republic of Gabon, central Africa, are known as natural fission reactors that sustained large-scale spontaneous fission reactions 2 billion years ago. Isotopic studies of the natural fission reactors provide useful and practical information on long-term repository of radioactive waste in geological media [1,2]. In this study, *in-situ* isotopic analyses of rare earth elements (REE) using a Sensitive High Resolution Micro-Probe (SHRIMP II) were performed on U- and REE bearing minerals in and around the Bangombé reactor to identify migration behavior of fissiogenic REE from the reactor.

The samples used in this study were collected from a part of long drill-core that consists of black pelite, clay, reactor core, and sandstone layers. Uraninite, coffinite, françoisite, florencite, goethite and zircon were observed as specific minerals in the samples. For *in-situ* REE isotopic measurements, masses from 142 to 153 were scanned, and determined $^{140}Ce/^{142}Ce$, $^{143}Nd/^{146}Nd$, $^{145}Nd/^{146}Nd$, $^{149}Sm/^{147}Sm$, $^{152}Sm/^{147}Sm$ and $^{153}Eu/^{151}Eu$ ratios.

Depth profile of $^{143}Nd/^{146}Nd$ in the figure shows a large difference of fissiogenic Nd distribution between sandstone (under the reactor) and black pelite (upper the reactor) layers. This result suggests that clay minerals surrounding the reactor play an important role to trap fissiogenic REE released from the reactor.



References

[1] Horie K., Hidaka H., and Gauthier-Lafaye (2004) *GCA* **68,** 115-125.

[2] Hidaka H. et al. (2005) *GCA* **69,** 685-694.