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Chemical homologue speciation in natural systems: a key to understand the anthropogenic RN fate

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Anthropogenic radionuclides (RN) are generated by a wide range of industrial, medical and military activities. In a context of storage in deep geological formations or after their release in terrestrial environnements by accidents, it is of paramount importance to quantify their mobility, which is partly ruled by their interaction with the solid surfaces. Usually, experiments are conducted using radiotracers at various scale from laboratory to the field in order to measure retention and retardation parameters. Although this kind of experiment is fundamental to tackle this issue, understanding the natural speciation of stable isotopes as chemical homologues to RN brings useful additional information. In particular, it sheds light on RN isotopic exchange and “irreversible” trapping mechanisms. This approach has already been used successfully to gain a better comprehension of iodine fate in the far-field of geological disposals (Claret et al., 2010), which was debated in the litterature, due to conflicting experimental results (from no retardation to significant retardation, depending on the study). By careful quantification of iodine reservoirs in the Callovian-Oxfordian clay rock , it was possible to provide new insights into this aspect of the iodine problem. The relevance of such approach for Sr (Lerouge et al., 2010), Se and Ni, three elements with contrasted chemical beaviours and of interest for radwaste storage will be discussed based on new experimental results.

Claret, F., et al., 2010. Natural iodine in a clay formation: Implications for iodine fate in geological disposals. GCA 74, 16-29.

Lerouge, C., et al. 2010. Strontium distribution and origins in a natural clayey formation (Callovian-Oxfordian, Paris Basin, France): A new sequential extraction procedure. GCA 74, 2926-2942.