Prospects of functionalized porous materials towards extraction of spent nuclear fuel radionuclides

Abstract.

Radioactive waste levels have continued to increase due to the growth and development of nuclear energy, industrial or medical radioactive use. In this regard, conventional radioactive waste generated by nuclear power plants cannot be ignored. Effective management of nuclear radioactive waste plays a vital role in alleviating negative impacts on the society and environment. Despite the progress that has been made concerning separation and recycling of spent nuclear fuel through the PUREX process, several gaps in knowledge still exist especially towards the development of a robust separation system based on solid phase extraction using porous materials. Solid phase extraction is being viewed as one of the most convenient and effective approaches in the removal of cations in radionuclide solutions. This is due to its ability to increase the selectivity and sensitivity of the method as it permits discriminatory binding of analyte to a solid support where the analyte can be collected and thereafter eluted using small quantity of a different solvent. The review covers the current methods used in aqueous nuclear reprocessing, highlights their deficiencies and introduces the potential of applying solid-phase extraction in management of nuclear waste. This study gives the prospects of functionalized porous sorbent materials as solid support in solid-phase extraction of spent nuclear fuel elements.