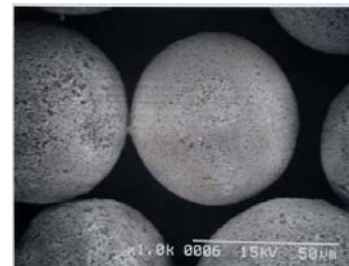


Separation of heat-generating fission product, Sr and Cs

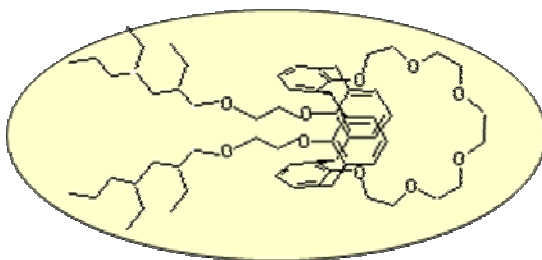
Spent nuclear fuel contains heat-generating fission products, which are not separated in a current Purex process and vitrified into glass matrix to produce high-level radioactive waste (HLW). HLW is needed to be stored about 50 years before its deep geological disposal to wait decay of major heat-generating nuclides, Sr and Cs (half life 30 years). In advanced nuclear fuel cycle, separation of Sr and Cs will contribute to reduction of the storage time and higher loading of other nuclides to HLW. Both adsorption-solidification and chromatographic separation methods are being studied in our laboratory.

Chemical stabilities as well as resistance against strong radiation and heat are required for separators of Sr and Cs. Some inorganic ion-exchangers as zeolites meet these requirements. Among zeolites, mordenite adsorbs Cs selectively from a neutral or acidic solution of fission products. After adsorption, Cs-loaded mordenite is converted to Cs-minerals by calcination. Conversion to Cs-minerals and characterization have been studied for solidification and disposal of Cs. For separation from Purex raffinate, novel inorganic exchangers have been synthesized via hydrothermal reaction aiming at higher chemical stability and affinities for Sr and Cs than zeolites in more concentrated acid solution..

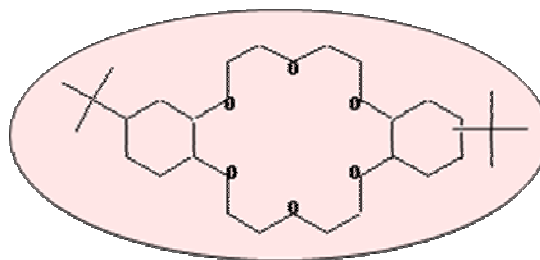
Extraction chromatography with cyclic organic compounds is for isolation of Sr and Cs from Purex raffinate solution. Crown ether (DtBuCH18C6) and Calix-crown (Calix-crown R14) are extractants selective for Sr and Cs, respectively. Each extractant is impregnated on porous silica carrier($\text{SiO}_2\text{-P}$), whose surface is coated with polymer. By the extraction chromatography pure Sr and Cs fractions were separated from concentrated acid solution of fission products. Optimization of separation conditions and radiation damage of extractants are being studied. [This study has been funded by MEXT.]



$\text{SiO}_2\text{-P}$
(extractant carrier)



Calix-crown R14 (Cs-extractant)



DtBuCH18C6 (Sr-extractant)