Leaching behaviors of Sr from Geopolymer and Cement Embedded Titanate Adsorbent

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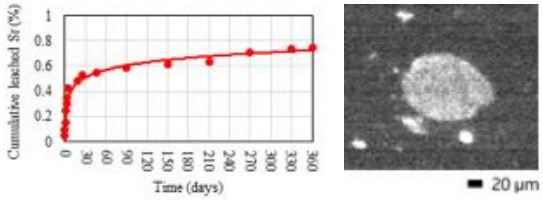
Titanate adsorbent has been used for removal of Sr from contaminated water in Fukushima Daiichi Nuclear Power Station. There has been produced spent adsorbents from the removal process. The spent adsorbents should be stabilized for long term storage and disposal. Glass, cement, and geopolymer are a candidate for the consolidation. However, there is not enough data to assess the leaching behavior of Sr from the adsorbent embedded in geopolymer matrix. In this context, leaching experiments and observation of Sr distribution for geopolymer and cement embedded titanate adsorbent with Sr are investigated to compare their leaching behaviors of Sr.

Potassium based geopolymer and ordinary Portland cement with and without 30% solid weight of titanate adsorbed strontium were manufactured for the leaching experiments until 360 days. From the results shown in the figure (a), 0.75% of Sr in geopolymer was leach out after 360 days immersion in deionized water. Most of Sr was continue remained in the geopolymer even after 360 days, although more than 10% Sr was leached out from the cement. From observation of Sr distribution by isotope microscope, Sr was remained in titanate adsorbent and not diffused into geopolymer matrix (b). Sr leaching was also limited from the geopolymer without titanate adsorbent. Geopolymer can accept spent adsorbent more than cement in terms of hydrogen generation because geopolymer has less free water than cement. Therefore, the above results implied that the geopolymer matrix has higher potential than the cement for long term storage and disposal of the spent titanate adsorbent in terms of limitation of Sr leaching and hydrogen generation.



(a) (b)

Figure: (a) Cumulative leached Sr from the geopolymer embedded adsorbent in deionized water as a function of time and (b) Sr distribution observed by isotope microscope