

616th ASRC Seminar

Date: 11:25 ~ 11:55 Friday, February 26

Location: Conference Hall, ASRC Building

Speaker: Dr. Takumi Saito
(University of Tokyo)

Title: Ligand promoted dissolution of ZrO_2

Abstract: Organic ligands can promote dissolution of sparsely dissolving metal oxides by forming complexes with their constituent metal ions in solution and/or directly adsorbing on their surfaces. The dissolution of zirconium oxide (ZrO_2), a well-known refractory oxide, is important to understand the behavior of fuel debris of a damaged nuclear reactor core in contact with (ground) water and to develop effective decontamination techniques for contamination with the debris, as Zr is contained in the debris at relatively large concentrations and likely determines their dissolution. Nevertheless, the effects of organic ligands on the dissolution of ZrO_2 has been unknown, which is being pursued in this research by batch-wise dissolution experiments of ZrO_2 in the presence of various organic ligands and *in-situ* ATR-FTIR spectroscopy. The dissolution of ZrO_2 was promoted by EDTA, NTA, and Ox; nevertheless, with DFO-B virtually no dissolution of ZrO_2 was observed. The magnitude of the dissolution increased as follows: NTA > Ox > EDTA (pH 8) \approx EDTA (pH 4). This suggests the dissolution of ZrO_2 is not controlled by aqueous complexation of Zr^{4+} with the ligands, as the corresponding stability constants follow EDTA > NTA > Ox. It was also found that the observed dissolution amounts showed no correlation with the adsorption amounts of the ligands. These findings clearly indicate an important role of detailed sorption structures of the ligands for the dissolution.

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