Study on the fate of radionuclide in concrete waste

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Introduction

Recently, decontamination and decommissioning of nuclear power plants became a rising issue followed by the decommissioning of Kori-1 plant in South Korea. Concrete materials in nuclear facilities may become contaminated or activated by various radionuclides through different mechanism. The objective of this study is to investigate the molecular scale characterization of radionuclides interaction and bonding structure in radioactive concrete waste. In order to investigate the bonding structure of radionuclide in activated and contaminated concrete, concrete sample was analyzed and characterized by ICP-MS, XRD, SEM-EDS, and XAS. Bonding structure of radionuclide in contaminated concrete can be applied to development of decontamination method and reduce the volume of concrete waste. Because Kori-1 plant is considered to start the decommissioning next year, the result of this study can be applied to the decommissioning of Kori-1 plant and decontamination of contaminated concrete.

Discussion of Results

Cobalt exists in low concentration (below 1 mg/Kg) in cement and it can be activation by exposed to radioactive materials. Cement sample was analyzed by X-ray absorption fine structure (XAFS) in Pohang Accelerator Laboratory and it exists as CoO form. The fate of Cobalt requied to investigate more and characterize the Cobalt distribution in the concrete samples. This study provides a significant insight into poorly understood infrastructural contamination in complex systems and is directly applicable to the South Korea's decommissioning efforts. The results of this study provide more basic information of radionuclide fate in concrete waste for decontamination method of concrete waste from decommisioning of Nuclear Power Plant.

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