様式Form

論 文 内 容 の 要 旨
Abstract of Dissertation

氏　名Name　I Wayan Ngarayana

This study examines the effect of surface oxidation in Cs chemisorption onto modern nuclear power plant structural materials. The examination is conducted using 4 types of materials; SS 304, SS 321, Inconel 600, and X-750 by following a liquid-solid reaction to simulate leakage parts to the environment. Although these materials have a similar oxide layer during normal operation, however, matrix composition variations and temperature changes during severe accidents may change their oxide film structures and contribute to the Cs chemisorption behavior. The diverse pre-oxide films are prepared from well-polished SS 304, SS 321, Inconel 600, and X-750 specimens following annealing procedures. The pre-oxide specimens are coated with liquified $CsOH{\cdot}H_2O$ and treated at 300–1050 ^oC in the air, then soaked in water. CsOH residues, including Cs_2FeO_4 and Cs_2CrO_4, dominate pre-soaked specimens but completely disappeared after soaking. Some Cs particles enriched with Ti, Al, and Si which are furthermore predicted mainly i.e., as $CsAlSiO_4$, $CsAlTiO_4$, and $CsAlO_2$ are retained on post-soaked specimens. Cs containing Si between outer and inner oxide layers are detected from cross-sectional observation, particularly in SS 304. While a small amount of Ti-enriched Cs compounds is located in the thin outer layer of SS 321, X-750, and Inconel 600. It is concluded that Cs enrichment on the inner layers is formed in the pre-existing layer and then overlapped with the growth of the outer oxide layer. These confirm the important role of oxidation in Cs chemisorption.

Keywords:　cesium, retention, chemisorption, SS 304, SS 321, Inconel 600, X-750, solute elements, oxidation