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ELECTRO DECONTAMINATION BEHAVIOR OF THE SIMULATED RADIOACTIVE NI-CO ALLOY WASTE USING ELECTROREFINING IN LICL-KCL 5-WT.% $NICL_2$

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As the number of end-of-life reactors increases in the world, the demand for decontamination technology is increasing. In Republic of Korea, there is an urgent need to secure nuclear power plant decommissioning technology as eight nuclear power plants will reach the end of their lifespans by 2030, the first being the Kori unit 1, which was the 161st nuclear power plant to be permanently shut down in the world on June, 2017. Presently, Republic of Korea is focusing on developing and supporting technology required for nuclear decommissioning, and 27 core technologies for decommissioning have been secured. However, there is insufficient development of decontamination technology for the reduction and recycling of large amounts of radioactive metal wastes, which totaled up to 26,255 m^3 in the case of the Kori unit 1. This study utilized an Inconel-1~10 wt. % Co alloy to simulate radioactive metal waste to investigate the decontamination potential of LiCl-KCl-5 wt.% $NiCl_2$ molten salt electrolytes. Electrochemical analysis was performed by conducting cyclic voltammetry to confirm the redox behavior of Ni ions in LiCl-KCl-5 wt.% $NiCl_2$ electrolytes. Decontamination experiments were performed by conducting cyclic voltammetry to analyze the oxidation behavior of Inconel-1~10 wt.% Co alloy metals (anode) and the reduction behavior of STS316L (40 mm x 80 mm x 0.5t) electrodes (cathode), in addition to the properties of the electrolyte. By conducting experiments, the reduction potential of Ni at a potential of-0.17 V (vs. W reference electrode) was confirmed, and the Co decontamination factor (DF) of the reduction product was found to have a value of 2,480 through ICP-MS analysis. The reduced products produced from the first electrolytic refining stage is expected to satisfy the allowable concentration for self-disposal (3.04 x 10^{-4} Bg/g) after the second electrolytic refining stage.

BIOGRAPHY

Woo-Seok Choi has studied at Chungnam University, Republic of Korea. His major is electroreduction and electrorefining. He has studied at the department of materials science and engineering and nanomaterial process laboratory of Prof. Jong-Hyeon Lee.

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