

Microstructure transformation during the electrolytic reduction of UO_2 to metallic U in molten $\text{Li}_2\text{O-LiCl}$ 최은영^{1,2,†}¹한국원자력연구원; ²UST(eychoi@kaeri.re.kr[†])

Molten salt electrolysis has been used as an effective and economical method to produce metal in a large-scale. Electrolytic reduction process, called as FFC (Fray-Farthing-Chen) Cambridge process, is a method in which solid oxides are reduced to the respective metals in molten salt as an electrolyte. Various metal oxides such as TiO_2 , SiO_2 , Ta_2O_5 , Fe_2O_3 , SnO_2 , Tb_4O_7 , Nb_2O_5 , Cr_2O_3 , and CeO_2 were applied. The electrochemical reduction process has been also applied to reduce nuclear spent oxide fuel (mainly composed of UO_2), which is aim to recover uranium and transuranic elements from the metallic fuel obtained through the electrochemical reduction process. In this study, it was observed that the microstructure of uranium oxide is affected by lithium metal ($\text{Li}^+ + \text{e} \rightarrow \text{Li}$) generated during the electrolytic reduction process of uranium oxide. It has been proven that if the diffusion rate of lithium metal is controlled by the electrolysis, the reaction time with the UO_2 changes, and the size of the particles can also change accordingly.