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A Parametric Study of Operating Carbon Anodes in the Oxide Reduction Process

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Abstract:

A parametric study of the electrolytic reduction of uranium dioxide in molten lithium chloride – lithium oxide using carbon anodes was conducted to determine the operational parameter values necessary for high yields. Operational parameters evaluated in this study include anode and cathode current densities, anodic polarization, UO_2 batch size, and method of electrochemical control. Seven oxide reduction experiments were conducted with between 25 g and 100 g UO_2. The current density on the cathode was the critical parameter, which indicates the reduction process is kinetically controlled by cathodic reactions. High cell currents were achieved without the application of high anodic potentials by using a large anode surface area. This approach facilitates efficient reduction at high throughput without production of chlorine or other corrosive gasses.

Keywords: Electrolytic reduction, pyroprocessing, carbon anode