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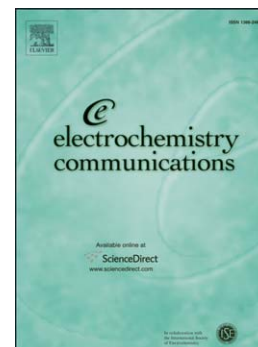
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# Enhanced electrochemical reduction of rare earth oxides in simulated oxide fuel via co-reduction of NiO in Li<sub>2</sub>O-LiCl salt

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## Abstract

Rare earth oxides in spent oxide fuel from nuclear plants have poor reducibility in the electrochemical reduction process, due to their high oxygen affinity and thermodynamic stability. Here we demonstrate that the extent of their reduction can be enhanced via co-reduction of NiO in a Li<sub>2</sub>O-LiCl electrolyte for the electrochemical reduction of a simulated oxide fuel (simfuel). First, the electrochemical behaviors of Nd<sub>2</sub>O<sub>3</sub>, NiO, and Nd<sub>2</sub>O<sub>3</sub>-NiO were studied by cyclic voltammetry and voltage control electrolysis. Then, the electrochemical reduction of the simfuel containing UO<sub>2</sub> and rare earth oxides (Nd<sub>2</sub>O<sub>3</sub>, La<sub>2</sub>O<sub>3</sub>, and CeO<sub>2</sub>) was conducted in molten LiCl salt with 1 wt.% Li<sub>2</sub>O via the co-reduction of NiO. The extent of reduction of the rare earth oxides was found to be significantly improved.

*Keywords: pyroprocessing, electrochemical reduction, molten salt, spent oxide fuel, rare earth oxides*

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