

Evaluation of Metal Oxide Coated Stainless Steel As a Potential Anode for Pyroprocessing

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ECS Meeting Abstracts, Volume MA2022-02, C03: Corrosion in Nuclear Energy Systems: From Cradle to Grave 2

Citation Craig Moore *et al* 2022 *Meet. Abstr.* **MA2022-02** 776

DOI 10.1149/MA2022-0212776mtgabs

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Abstract

Pyroprocessing is a potential route to close the nuclear fuel cycle. Used nuclear fuel (UNF) is electrolytically reduced from UO_2 to U^0 at a stainless-steel cathode while oxygen evolution occurs at a platinum anode in a molten $\text{LiCl-Li}_2\text{O}$ environment. Platinum is consumed during this process as a result of the formation and spallation of lithium platinate. To increase the economic viability of pyroprocessing, alternative low-cost, electrochemically efficient materials are needed to replace platinum. In this study, metal-oxide coated 316L stainless steel rods were explored as potential replacements. The characteristics of these coatings in molten $\text{LiCl-Li}_2\text{O}$ was evaluated through electrochemical techniques. The surface chemistry of the coatings was explored through X-ray photoelectron spectroscopy, X-ray diffraction, Raman spectroscopy and scanning electron microscopy before and after exposure to molten salts to understand the degradation of the coatings. Results detailing the performance of the coatings will be presented.

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