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R-441

ASSESSMENT OF ALTERNATIVE OXIDIZING REAGENTS FOR CONDITIONING BWR AND PWR OXIDES

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CHEMISTRY

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Objectives: To assess several possible alternative oxidizing reagents for conditioning PWR and BWR oxides.

An oxidizing pre-treatment is required to remove Cr-rich oxides from the reactor coolant system (RCS) in PWRs. In addition, implementation of hydrogen water chemistry (HWC) in BWRs has resulted in the formation of chromium enriched oxides on BWR surfaces. In the decontamination of PWRs and BWRs in the US, an alkaline solution of potassium permanganate has typically been used to pre-treat Cr-rich oxides before dissolving them in reducing solutions.

Comments: Possible improvements in the Alkaline Permanganate (AP) reagent include: - reducing waste volumes generated during PWR and BWR decontaminations - improving the effectiveness of the oxidizing pre-treatment for the decontamination of BWRs that operate under HWC, zinc injection, or both - minimizing decomposition of AP (minimizing waste generation and particulate formation) - improved methods for destruction of permanganate (speed, particulate formation, corrosion of system materials)

Remarks: Several possible alternatives have been assessed and it has been determined that the most promising is permanganic acid (HP). HP offers the benefits of shorter application times and a 40% reduction in volume of waste generated compared to the AP reagent.

Results of loop runs performed at AECL indicate that the application of the HP reagent resulted in high decontamination factors in the decontamination of Cr- and Zn-rich BWR oxides. Decontamination factors for Cr- and Zn-rich oxides exposed to HP/CAN-DEREM were three to seven times greater than those obtained in an AP/CAN-DEREM decontamination. Corrosion of key RCS materials was comparable in the HP/CAN-DEREM and AP/CAN-DEREM decontaminations.

References: Speranzini, R.A., and D.G. Miller "Assessment of Alternative Oxidizing Reagents for Conditioning BWR and PWR Oxides" Proceedings, EPRI Radiation Field Control

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