Electrochemical Estimation on the Applicability of Nickel Plating to EAC Problems in CRDM Nozzle

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Abstract

The applicability of nickel-plating to EAC problems in CRDM nozzle was estimated in the light of electrochemical aspect. The passive film growth law for nickel was improved to include oxide dissolution rate improving conventional point defect model to explain retarded passivation of plated nickel in PWR primary side water environment and compared with experimental data. According to this model, oxide growth and passivation current is closely related with oxide dissolution rate because steady state is made only if oxide formation and oxide destruction rate are same, from which oxide dissolution rate constant, k_s, was quantitatively obtained utilizing experimental data. Commonly observed current-time behavior, $i \propto t^m$, where m is different from 1 or 0.5, for passive film formation can be accounted for by virtue of enhanced oxide dissolution in high temperature aqueous environment.