Impact of KOH Primary Coolant Chemistry on Pressurized Water Reactor's Operating with Fuel Crud

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Lithium hydroxide enriched in ^{7}Li is used to control the pH in the coolant of a pressurized water recator (PWR), while boric acid is added to control reactivity. Naturally occurring potassium hydroxide is under consideration as a replacement for lithium hydroxide as it is much more readily available. Although the fuel cycle would start with potassium as the only alkali in the coolant, the concentration of ^{7}Li would build up as the cycle progressed owing to the ^{10}B(n,alpha)^{7}Li reaction. What the consequences of these bulk coolant chemistry changes might be on the chemistry and conditions within PWR fuel crud is unknown, so a modelling study has been performed to answer this question.

Changes to the NNL/EPRI crud chemistry model have been carried out to take into account the coolant of a PWR containing both lithium and potassium instead of just lithium and these changes are described in this paper. The modified model has then been used to investigate precipitation of potassium borates in fuel crud. The model predicts the temperature and pH conditions within crud operating with bulk coolant potassium chemistry and these parameters for typical operating conditions are described. The possibility of CIPS (Crud Induced Power Shifts) and CILC (Crud Induced Localized Clad Corrosion) for a plant operating with potassium water chemistry and fuel crud are discussed.