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THERMODYNAMIC STABILITY OF CHROMIUM AND NICKEL OXIDES IN DIFFERENT SALT SOLUTIONS

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The U.S. Department of Energy has indicated it may use Alloy 22 as the waste package outer container material for the potential high-level waste repository at Yucca Mountain, Nevada. Long-term performance of Alloy 22 depends in-part on the stability of the passive film on the surface of the material. The passive film forms due to solid state anodic oxidation of chromium and nickel metals present in Alloy 22. A stable passive film may protect Alloy 22 from elevated general corrosion rates and localized corrosion in the potential repository environment. The dominant constituents of the passive film on Alloy 22 are chromium and nickel oxides. This paper examines the thermodynamic stability of a nickel and chromium oxide mixture in different salt solutions. The simulations are carried out using the thermodynamic software MTDATA, which predicts the phases formed at chemical equilibrium. The calculated results are analyzed for various solid and aqueous phase species that would be thermodynamically stable in a given salt solution. The salt solution composition and temperature are varied.

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