

Electrochemical behavior of Pu and Np in nitric acid media

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The first step of the spent nuclear fuel reprocessing is a dissolution of actinides and fission products in hot nitric acid at high concentration. Among all these species, the knowledge of redox plutonium and neptunium equilibria between their oxidation states is essential to understand the chemical behaviour on many chemical conditions. Nevertheless, the determination of speciation in this media is a challenge especially for a better understanding of corrosion mechanism in the dissolution medium.

Thus this talk proposes to determine the electrochemical behaviour of plutonium and neptunium and especially the Pu(IV)/Pu(III), Pu(VI)/Pu(V), Np(VI)/(V) and Pu(V)/Pu(IV) redox couple in nitric acid media and to acquire thermodynamic and kinetic constants at higher temperatures than 25°C and higher nitric concentration than 1 mol/L.

Moreover, the electrochemical behaviour of the Np(VI)/Np(V) redox system in different nitrate media was investigated by electrochemical techniques, in order to better understand the impact of the complexation of Np(VI) by nitrate ions on the redox potential. It was shown that the apparent standard potential of the Np(VI)/Np(V) couple do not depend on either nitrate concentration or temperature.

Keywords: plutonium; neptunium; nitric acid; cyclic and linear sweep voltammetry; formal potential; nitrate complexation