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## Redox Behavior of Neptunium in Irradiated Aqueous Solutions of Nitric Acid in Presence of an Extracting Organic Phase

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A reliable solvent extraction process for separation of neptunium from irradiated nuclear fuels depends upon the maintenance of a valence state amenable to complexation by tributylphosphate (TBP). However, radiolytic generation of nitrous acid in irradiated nitric acid solution may reduce extractable Np(VI) into non-extractable Np(V). One complicating factor that has so far not been well investigated is the influence of the presence of an extracting organic phase on the redox speciation and extraction of neptunium during radiolysis; hence, the rates and total yields of radiolytic reduction of neptunium were measured in varying concentrations of nitric acid, both in the presence and absence of a 30% TBP/dodecane organic phase. In the aqueous solution, greater concentrations of nitrous acid were produced at higher nitric acid, although this did not necessarily result in faster reduction rates for Np(VI). This is likely because of oxidation of Np(V) directly by nitric acid and by oxidizing radicals produced by radiolysis of aqueous nitric acid. The presence of the organic phase appeared to protect Np(VI) from reduction, perhaps due to complexation by TBP.

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