Contribution ID: **272** Type: **Poster presentation**

Decay of Hexaaquo Nickel(I) and Zinc(I) Ions in High Temperature Water

Wednesday, 20 May 2015 14:00 (3h 30m)

The decay of the monovalent transition metal ions (Ni+(aq) and Zn+(aq)) in pure water have been studied at temperatures up to 300oC using a pulse radiolysis technique with a transient UV-visible detection system. The results indicate that the reactions of the hexaaquo ions with radiolytic oxidizing species are responsible for this phenomenon. The disportionation nature of the ions has been investigated in aqueous methanol. The kinetics model based on water radiolysis has shown that Ni+(aq) ions do not proportionate. Unlike Ni+(aq), Zn+(aq) ions undergo disproportionation generating metallic zinc with a relatively slow rate. The application of Smoluchowski equation has revealed that all of the reactions investigated are not diffusion-controlled, one exception being the reaction of Ni+(aq) with ●OH radicals at room temperature. The reaction activation energies and the high-temperature optical spectra of Ni+(aq) and Zn+(aq) have been reported.

Summary

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Session Classification: Poster-1

Track Classification: Atomic Physics, Quantum Physics, Molecular and Chemical Physics