The Reaction Mechanism and Rate Constants in the Radiolysis of Fe2+-Cu2+ Solutions

Pulse radiolysis and gamma radiolysis have been used to study the reaction mechanism in the radiolysis of aqueous solutions of Fe2+ and Cu2+. A reaction scheme has been developed and confirmed by computation of the corresponding complete set of differential equations. The rate constants for some of the reactions have been determined at different pH's: $k_{\mathrm{Cu}^{+} + \mathrm{O}_2} = 4.6 \times 10^5$ and $1.0 \times 10^6 \ \text{mol}^{-1} \ \text{sec}^{-1}$, $k_{\mathrm{Cu}^{+} + \mathrm{Fe}^{3+}} = 5.5 \times 10^6$ and $1.3 \times 10^7 \ \text{mol}^{-1} \ \text{sec}^{-1}$, $k_{\mathrm{Cu}^{\text{III}} + \mathrm{Fe}^{2+}} = 3.3 \times 10^8$ and $1.3 \times 10^8 \ \text{mol}^{-1} \ \text{sec}^{-1}$ in pH 2.1 H2SO4 and HClO4, respectively.

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