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Kinetics and mechanism of the oxidation of diaquabis(1,10-phenanthroline) iron(II) by periodate in aqueous and micellar media

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TRANSITION METAL CHEMISTRY

Volume: 41 Issue: 3 Pages: 357-362

DOI: 10.1007/s11243-016-0032-9

Published: APR 2016

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Abstract

The kinetics of oxidation of $[\text{Fe-II}(\text{phen})_2(\text{H}_2\text{O})_2]^{2+}$ (phen = 1,10-phenanthroline) by periodate were investigated in aqueous acidic medium at different $[\text{H}^+]$ over a temperature range of 20-40 A degrees C. The reaction was studied under pseudo-first-order conditions by taking $[\text{IO}_4^-] > 10$ tenfold over $[\text{Fe-II}(\text{phen})_2(\text{H}_2\text{O})_2]^{2+}$. The reaction rate increases with increasing $[\text{H}^+]$, and the kinetics of oxidation obeyed the following rate law: The surfactant sodium dodecyl sulfate was found to enhance the rate, whereas cetyltrimethylammonium bromide had little effect. Activation parameters associated with k_2 and k_3 were calculated. An electron transfer from Fe(II) to I(VII) is identified as the rate-determining step. The I(VI) species thus generated reacts in a fast step with another Fe(II) complex.

Keywords

Keywords Plus: ELECTRON-TRANSFER; COMPLEXES; ACID; LIGANDS; CATALYSIS; CHEMISTRY

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Funding

Funding Agency	Grant Number
Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah	130 - 584 - D1435
DSR	

[View funding text](#)

Publisher

SPRINGER, VAN GODEWIJKSTRAAT 30, 3311 GZ DORDRECHT, NETHERLANDS

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