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Copper (III) Periodate Complex-A Portable Oxidant for the Free Radical Induced Oxidation of Thiamine Hydrochloride

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ABSTRACT

The oxidation of thiamine hydrochloride by diperiodatocuprate (III) (DPC) in aqueous alkaline medium at a constant ionic strength of 0.18 mol dm^{3} was investigated spectrophotometrically. 1:3 stoichiometry (thaimine:DPC) was exhibited between the reaction of thiamine and DPC in aqueous alkaline medium. The orders of the reaction with respect to [DPC] and [thiamine] were unity and less than unity respectively in the concentration ranges studied. The rate of the reaction increased as the concentration of alkali increased and periodate had retarding effect on the rate of reaction. Ionic strength and dielectric constant had a negligible effect on the reaction rate. The main reaction products were identified by spot test and spectroscopic analysis. A mechanism involving free radical was proposed. The activation parameters for the slow step of the mechanism and also the thermodynamic quantities for different steps of mechanism were determined and discussed.

Highlights

- A mechanism of oxidation of Thaimine by Diperiodatocuprate(III) is proposed on kinetics results.
- The $[Cu(H_2IO_6)(H_2O)_2]$ was considered as active species for the title reaction.
- In carrying the reaction, the role of pH is crucial.
- Activation parameters were computed and discussed
- The overall sequences described are consistent with the present kinetics studies.

Keywords: Thiamine (vitaminB_1), Diperiodatocuprate(III), Kinetics, Mechanism, Oxidation.