



Oxidation of D(+) Fructose by Sodium Metaperiodate in Alkaline Medium using $[\text{RhCl}_3(\text{H}_2\text{O})_2\text{OH}]^-$ Complex as a Homogeneous Catalyst

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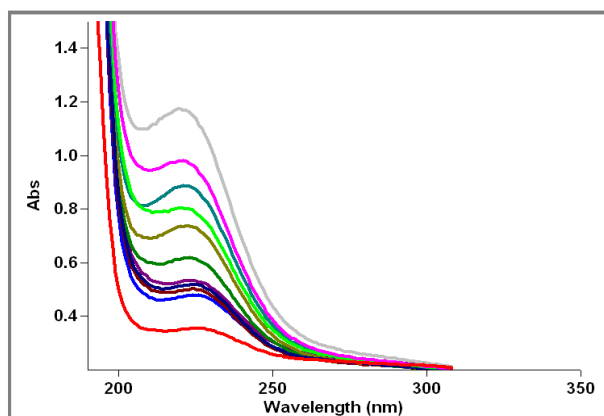
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Accepted on 8th May, 2019

ABSTRACT

The present paper deals with the kinetics and mechanism of Rh(III)-catalyzed oxidation of D- fructose by sodium metaperiodate in alkaline medium at temperature $40^\circ\text{C} \pm 0.1^\circ\text{C}$. The reaction shows first-order kinetics with respect to $[\text{IO}_4^-]$, $[\text{Rh(III)}]$ and $[\text{Fructose}]$ throughout their variations. First-order kinetics in $[\text{OH}^-]$ at its low concentrations tends to zero-order at higher concentrations. Nil effect of $[\text{Cl}^-]$ on the rate of oxidation of fructose has been observed. There was no effects of ionic strength (μ) and dielectric constant (D) of the medium on the rate of the oxidation was observed. From the study of effect of temperature on the rate of reaction, various activation parameters such as energy of activation, enthalpy of activation along with entropy of activation were calculated. $[\text{RhCl}_3(\text{H}_2\text{O})_2\text{OH}]^-$ and $\text{H}_2\text{IO}_6^{3-}$ were postulated as the main reactive species of Rh(III)-chloride and IO_4^- in alkaline medium, respectively. A most probable reaction mechanism has been proposed in the light of observed kinetic orders, activation parameters and spectrophotometric evidences collected for the existence of reactive species of oxidant and catalyst as well as for the formation of complexes during the course of reaction.

Graphical Abstract



Spectra of solutions [1-11] recorded at room temperature.

Keywords: Oxidation, Rh(III), D-fructose, Alkaline medium, NaIO_4