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# Kinetics and Mechanism of Ru(III)-Catalyzed Oxidation of Tetracycline Hydrate by $Cu(Bip)_2^{2+}$ in Alkaline Medium: A Spectrophotometric Studies

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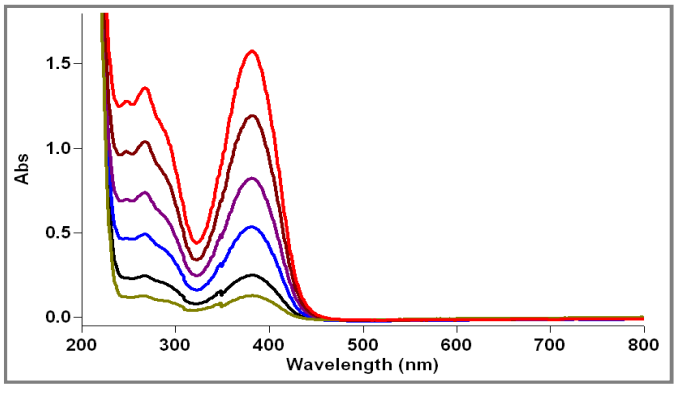
## ABSTRACT

*Kinetic studies in homogeneously Ru(III)-catalyzed oxidation of antibiotics i.e. tetracycline hydrate by copper bipyridyl ($Cu(Bip)_2^{2+}$) in presence of alkaline medium has been made at $35^0$C. The reaction exhibits pseudo first-order kinetics with respect to [$Cu(Bip)_2^{2+}$] and is first-order with respect to lower [Ru(III)] but tend towards zeroth order at higher [Ru(III)]. The reaction shows first-order kinetics with respect to [Tetracycline hydrate] throughout its variation. The reactions are zero order with respect to both[$OH^-$] and [Bipyridyl]. The rate of the oxidation is unaffected by the change in ionic strength (I) as well as dielectric constant (D) of the medium. $Cu(Bip)_2^{2+}$, tetracycline hydrate as such and [$RuCl_2(H_2O)_3OH$] have been assumed as the reactive species of Copper bipyridyl, tetracycline hydrate andRu(III) chloride in alkaline medium, respectively. The reaction was studied at four different temperatures and observed values of rate constants were utilized to calculate various activation parameters specially the entropy of activation ($\Delta S^{\#}$). Kinetic studies together with spectral information, activation parameters and multiple regression analysis were made a basis for the formation of reaction mechanism for the catalyzed oxidation of tetracycline hydrate.*

## Graphical Abstract




Spectra of tetracycline hydrate solutions recorded at room temperature.

**Keywords:** Alkaline medium, Catalysis Copper-bipyridyl complex, Spectrophotometric study, Tetracycline hydrate.