



Indian Journal of Chemistry
Vol. 62, December 2023, pp. 1268-1275
DOI: 10.56042/ijc.v62i12.5608

Journal of Science Communication and Public Interest
NISUPR
सीएसआईआर-निसुपर

Role of surfactants on Fe(II) catalyzed L-tryptophan oxidation by persulfate

Abhishek Srivastava^a, Madhav Krishna Goswami^a, Krishna Srivastava^a & Neetu Srivastava^{*a}

^aDepartment of Chemistry, GLA University, Mathura 281 406, Uttar Pradesh, India

^bFaculty of Chemical Sciences, Shri Ramswaroop Memorial University, Barabanki 225 003, Uttar Pradesh, India

^cDepartment of Chemistry, D.D.U. Gorakhpur University, Gorakhpur 273 001, Uttar Pradesh, India

E-mail: neetusrivastav25@gmail.com

Received 15 September 2023; accepted (revised) 24 November 2023

The present study aims to explore the kinetics of Fe(II) catalyzed L-tryptophan (Trp) oxidation in micellar media by persulfate ion ($S_2O_8^{2-}$). The reaction's progress has been analyzed as an indicator of $[S_2O_8^{2-}]$, temperature, $[Trp]$, $[Fe(II)]$, $[Surfactant]$, ionic strength, and $[H^+]$. The $S_2O_8^{2-}$ undergoes a 1:1 stoichiometric interaction with Trp. The observed reaction exhibits first-order kinetics with regards to $[S_2O_8^{2-}]$, fractional-first-order with respect to $[H^+]$, linear reliance to $[Fe(II)]$, and invariance with respect to $[Trp]$ within the range of concentrations investigated. The observed decrement in reaction rate upon electrolyte introduction is suggestive of a negative salt effect. The oxidation rate is significantly enhanced by Fe(II) solution (as a catalyst) at lower concentrations. Both the cationic cetyltrimethylammonium bromide (CTAB) and the anionic sodium dodecyl sulfate (SDS) have been shown to inhibit the oxidation rate, while the non-ionic Triton X-100 (TX-100) does not have a noticeable impact on the reaction rate.

Keywords: Surfactant, Micelle encapsulation, Oxidation, Persulfate, Iron(II) catalyzed, L- Tryptophan