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Electrochemical Degradation of 3-(dimethylamino)-7-(methylamino) phenothiazin-5-ium chloride Dye at Barium/Graphite Modified Electrode in Aqueous Solution

C. N. Kumara, H. C. Charan Kumar and Sannaiah Ananda*

Department of Studies in Chemistry, University of Mysore, Manasagangothri, Mysuru, **INDIA**

Email: snananda@yahoo.com

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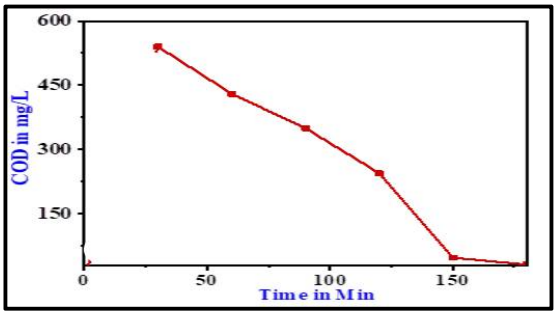
ABSTRACT

In this work Barium/Graphite modified electrode(Ba/GME)has been successfully developed by electrochemical method which is simple and inexpensive method. The developed graphite modified electrode was used for electrochemical degradation of wastewater containing azure B dye. The kinetics study of the dye degradation by graphite and Ba/graphite modified electrode are compared. Azure B[AB] is one of the most important textile dye. The developed modified electrode was characterized by SEM/EDAX, UV-Visible spectra. The thin film formation of Ba or encapsulated in graphite rod is observed from SEM/EDAX .The effect of concentration of the dye, effect of current and effect of temperature on the kinetics of degradation were studied. The degradation rate increases with increasing current and electrochemical degradation of azure B at Ba/GME follows 1st order kinetics up to 70% of the reaction. Electrochemical oxidation in presence of unmodified graphite electrode and Ba/GME was capable of destroying the chromophore groups of dye found in industrial effluents at short treatment times, low energy consumption and reuse of graphite electrode. The Instantaneous current efficiency (ICE) values of different experimental conditions are evaluated. The thermodynamic parameters for graphite and Ba/GME were studied. The anodic oxidation by Ba/GME showed the complete degradation of water containing azure B, which is confirmed by UV-Visible spectra and COD measurements. The dye is converted into CO_2, H_2O and simpler inorganic salts. The results observed for reuse of modified electrodes indicates that the Ba/GME would be promising anode for electrochemical degradation of azure B dye. The rates of elimination of azure B and COD decreases were higher on the Ba/GME compare to graphite electrode. This method can be applied for the remediation of waste water containing organics and cost effective.

Graphical Abstract



The rate of decrease of COD at different intervals of time.