Indium tin oxide coated conducting glass electrode for electrochemical destruction of textile colorants

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Abstract

Galvanostatic oxidation of 5.0×10^{-2} mM textile dyes such as Eosin Y (EY) and Orange II (Or II) was carried out on an indium tin oxide (ITO) coated glass anode in the presence of 1.0×10^{-2} mM KCl solution at pH 4.0 and 6.0. The degradation results of EY were compared with that of highly stable azo dyes (Or II). EY dye solution with a concentration of 5.0×10^{-2} mM is totally decolorized in 30 min at an electrical charge (Q) 0.067 A h dm^{-3} while 5.0×10^{-2} mM Or II degraded in a little less than an hour at the same electrical charge density. The decay kinetics of dyes follows a pseudo first-order reaction. The degradation of dyes is faster in acidic pH values than in basic pH values. Electrochemical degradation results show significant decrease in chemical oxygen demand (COD) values after electrodegradation of textile dyes. The key advantage of the ITO conducting glass anode is that the deposition of polymeric materials on the anode surface during electro-degradation of textile dyes is absent and therefore the electrode fouling is not observed. Hence, the ITO anodes can be employed an extended period without loss of activity.

Keywords: Orange II; Eosin; Electro-degradation; Azo dyes; Electrochemical destruction