Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

OXIDATION OF AZO DYE, CARMOISINE (E122) IN AQUEOUS SOLUTION BY HETEROGENEOUS CATALYST CUO/AL$_2$O$_3$ SYSTEM

Djedjiga Bousalah[1,2*], Ahmed Réda Yeddou[3], Messaoud Hachemi[1], Abdelmalek Chergui[3,4], Boubekeur Nadjemi[3]

[1]Unité de Recherche : Matériaux, Procédés et Environnement URMPE, Université M'Hamed Bougara, Avenue de l'Indépendance, 35000 – Boumerdès, Algérie.
[2]Centre de recherche scientifique et technique en analyses physico-chimiques(CRAPC), BP 384, zone industrielle Bou-Ismail RP 42004, Tipaza, Algérie.
[3]Laboratoire d'Etude et de Développement des Techniques de Traitement et d'Epuration des Eaux et de Gestion Environnementale, Ecole Normale Supérieure Kouba, BP 92 Vieux Kouba, Alger 16050, Algérie.
[4]Laboratoire des Sciences et Techniques de l'Environnement, Département Génie de l'Environnement, École Nationale Polytechnique, 10 Avenue Hassen Badi, BP 182, El-Harrach 16200, Alger, Algérie

Abstract

Heterogeneous oxidation system for the removal of azo-food dye from aqueous solution was studied in the presence of CuO/Al_2O_3 catalyst. This catalyst was prepared by impregnation method using a cupric salt solution at pH=5, followed by calcination at 450 °C. The result catalyst was characterized by X-ray Diffraction (XRD) and Scanning Electron Microscopy-Energy Dispersive X-Ray Spectroscopy (SEM-EDX), where the results confirmed a high crystallinity, good chemical stability of the catalyst used in four consecutive cycles and the presence of the elements (Cu, O, Al) composing the catalyst. Several parameters affecting dye degradation such as: solution pH, H_2O_2 concentration, catalyst dose, and reaction temperature were investigated. CuO/Al_2O_3 catalyst offers higher activation efficiencies than the homogeneous Cu^{2+} ions, as well as good operational stability and efficiently generate $HO^{\bullet}$ in neutral aqueous solutions. Complete decolorization (100 %) of Carmoisine (500 mg/L) was achieved in 240 min at neutral pH.

Keywords: advanced oxidation processes, Copper-impregnated activated alumina, food dye, heterogeneous catalysis, Hydrogen peroxide, removal

Received: January, 2020; Revised final: April, 2020; Accepted: September, 2020

[*] Authors to whom all correspondence should be addressed: e-mail:bousalahdj2015@gmail.com; Phone: (+213) 0795 553 650; Fax: (+213) 024 819 424