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Copper modified exchanger for the photodegradation of methyl orange dye

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ABSTRACT

A Cu modified hybrid exchanger was synthesized by loading Cu(II) onto the sulfonic acid sites of the C-145 cation exchanger by passing $CuSO_4$ solution followed by treatment with sodium hydroxide to deposit the copper hydroxide particles. Each hybrid sorbent particle is essentially a spherical macroporous cation exchanger bead within which agglomerates of nanoscale hydrated Cu oxide particles have been uniformly and irreversibly dispersed using a simple chemical–thermal treatment. The obtained material was characterized using X-ray diffraction, energy-dispersive X-ray spectroscopy and scanning electron microscope. The obtained materials were applied for the photo-decolorization of methyl orange as a member of the azo dye family, in an aqueous medium using UV irradiation ($\lambda = 254$ nm) under different experimental conditions. The effect of catalyst concentration and pH on the decolorization of methyl orange dye was investigated. The decolorization of methyl orange dye has been followed using UV–vis spectrophotometry. Results showed that the addition of Cu modified hybrid exchangers to the dye solution as well as pH change greatly enhanced the rate of degradation. The decolorization was found to be governed by the adsorption mechanism and followed the pseudo-first-order kinetics model and a significant mineralization of MO was observed.

Keywords: Polymeric material; Supported HCuO; Methyl orange photocatalytic degradation; Intermediates

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