

Decolorization of Malachite Green by hydrogen peroxide using heterogeneous catalysis by mixed iron oxides

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Abstract

The majority of the dyes dumped into the water bodies by industries are toxic and even carcinogenic to both animals and humans. Our objectives in this research were to demonstrate the effectiveness of the Goethite (Iron oxides) in the phototransformation process of a cationic dye (Malachite Green (VM)) by different systems. In the absence of light and in our experimental conditions, interaction between the VM and the Goethite has been highlighted. This interaction is attributed to a physical adsorption reaches a rate of 30% after 4h, which confirms the monitoring of the mineralization in terms of TOC. The addition of H₂O₂ accelerates the thermal process in VM-Goethite system. The phototransformation of the VM in the presence of Goethite has been studied. Results show that the photodegradation is characterized by fast kinetics and seems to be dependent on several parameters. The use of free radical inhibitors (tert-butanol) has shown that the reaction mechanism is governed by •OH radicals. Moreover, the follow-up of the formation of Fe (II) during the reaction is also a confirmation of this result. The addition of H₂O₂ to the solution improves the phototransformation of VM. The addition of tert-butanol to the VM-Goethite-H₂O₂ system like free radical inhibitors the degradation is affected low phototransformation of the VM. This results show that the degradation by the contribution of the •OH radicals and by the through non-radical mechanism.

Keywords: Malachite Green, Goethite, Photodegradation, Hydroxyl radicals, Hydrogen peroxide, Fenton.