

A STUDY ON RUSTY WASTE AS A CATALYST IN ENHANCING THE HETEROGENEOUS PHOTO-FENTON PROCESS AT NEAR-NEUTRAL PH FOR METHYL ORANGE DISCOLORATION

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ABSTRACT

This study aims to enhance the photo-Fenton process for the degradation of methyl orange dye at near-neutral pH by utilizing rusty waste, which contains a high concentration of Fe_2O_3 , as a solid catalyst instead of Fe^{2+} ions. The heterogeneous photo-Fenton method involves irradiating UV light into a solution composed of H_2O_2 , rust waste, and methyl orange dye. The optimization process included variations in the catalyst dose, H_2O_2 concentration, initial concentration of methyl orange, solution pH, and duration of irradiation.

The study found that Fe_2O_3 powder can be purified from rusty waste. The utilization of Fe_2O_3 powder in the photo-Fenton process resulted in 96% photodegradation of methyl orange dye at neutral pH, compared to 85% for the homogeneous photo-Fenton process. The optimal conditions for dye photodegradation were a 1:25 Fe to H_2O_2 mole ratio at pH 7, achieving 96.10% breakdown after 60 minutes of UV exposure. This discovery highlights that rusty waste is a valuable resource for dye pollution treatment through a low-cost procedure.

Keywords: Methyl orange, Rusty waste, Photo-Fenton process, Degradation, Heterogeneous catalyst.