



Photocatalytic activity of natural ground hematite in heterogeneous photo-Fenton process

Özkan Açışlı

Department of Petroleum and Natural Gas Engineering, Oltu Earth Sciences Faculty, Ataturk University, 25400 Oltu, Erzurum, Turkey, Tel. +90 442 816 4478-5940; Fax: +90 442 816 4479, email: ozkan.acisli@atauni.edu.tr

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ABSTRACT

The removal of Malachite Green (MG) dye from aqueous solutions was examined in this study using natural ground hematite (Fe_2O_3) particles in heterogeneous photo-Fenton process. Within this scope, a natural hematite sample was first ground by a high-energy planetary ball mill. Photo-catalytic activity of the produced ultrafine particles was then studied with various processing variables such as catalyst dosage, initial dye concentration, H_2O_2 concentration, reusability and initial pH. Prior to the experiments, the prepared catalyst was characterized in many ways by means of numerous analytical techniques and measurement methods. Elemental and mineralogical analyses confirmed high hematite inclusion with a very low amount of quartz. The surface area increased to $65.547 \text{ m}^2 \text{ g}^{-1}$ as a result of the ball-milling process, pointing out improved catalytic property of the prepared sample. The experimental results indicated that the prepared catalyst provided a decolorization efficiency of 97.90% for the optimum conditions of 0.50 g L^{-1} catalyst dosage, 10 mg L^{-1} initial MG concentration, $15 \text{ mM H}_2\text{O}_2$ concentration and pH 11.0 at 120 min reaction time. Overall results suggested that, for the degradation of MG, natural ground hematite mineral can be effectively used as a heterogeneous catalyst in the photo-Fenton process due to the enhanced radiation scattering with respect to the classical process.

Keywords: Photo-Fenton; Hematite; Degradation of dye; Catalyst; Heterogeneous process
