

Studies on photodegradation of malachite green using TiO₂/ZnO photocatalyst

Priti Bansal^{a*}, Navneet Bhullar^b, Dhiraj Sud^b

^aDepartment of Applied Sciences, YCoE, Punjabi University, Guru Kashi Campus, Talwandi Sabo 151302, Bhatinda, Punjab, India

Tel. +91 9417540285; Fax +91 1655220444; email: preet2aanand@yahoo.co.in

^bDepartment of Chemistry, Sant Longowal Institute of Engineering and Technology, Longowal 148106, Sangrur, Punjab, India

Received 20 July 2008; Accepted 3 September 2009

ABSTRACT

Wastewater containing dyes emanating from textile mills is strongly colored and is carcinogenic in nature. In order to reduce pollution load it is desirable to degrade the dye into non-toxic form before its discharge into the main stream. The present paper reports the photocatalytic degradation of malachite green (MG). MG is used to dye materials like silk, paper and leather. The batch experiments were carried out by irradiating the aqueous solution of dye in the presence of photocatalysts and UV light. The photocatalysts used for the study are titanium dioxide (TiO₂), zinc oxide (ZnO), and different ratios of ZnO and TiO₂. The rate of decolorization was estimated from residual concentration spectrophotometrically. The effect of process parameters viz. pH 2–9, initial concentration of dye 5–50 ppm and amount of catalyst 0.5–1.5 g/l on degradation of the dye has also been assessed. The experimental results indicated that ZnO efficiently compete with TiO₂ in terms of percentage degradation of MG. Maximum degradation of dye occurs in acidic range with TiO₂ and at neutral pH with ZnO. When photocatalysts are mixed in different ratios, best results were obtained with ZnO and TiO₂ in the ratio of 9:1. The high decolorizing efficiency was obtained with 1.0 g/l of catalyst dose.

Keywords: Decolorization; Photocatalytic degradation; ZnO; TiO₂; Malachite green

* Corresponding author.