

ORIGINAL RESEARCH PAPER

Photocatalytic degradation study of Methyl Orange and Congo red using Mg-Co ferrite powder

S. D. Jadhav*, R. S. Patil

Department of Chemistry, Yashwantrao Chavan College of Science, Karad Shivaji University, Kolhapur, (MH) India.

Received: 2022-03-05

Accepted: 2022-04-25

Published: 2022-05-01

ABSTRACT

The photocatalytic degradation of methyl orange and Congo red dye was performed under the illumination of visible light (Philips 250Watt) as a source of photons. The complete distraction of the aromatic ring was ascertained by UV spectroscopic analysis. A decrease in dye concentration and an increase in the concentration of CO₂ indicate dye mineralization. The behavior of this reaction was pseudo-first-order and the maximum photodecolorization efficiency was ~85.16% for Methyl orange and ~ 95.40 for Congo red in 120-150 min. at 30°C.

Keywords: Ferrite, Co-precipitation, X-ray Diffraction, Scanning electron microscopy, Transmission electron microscopy (TEM), Photodegradation of dye.

How to cite this article

Jadhav S. D., Patil R. S. Photocatalytic degradation study of Methyl Orange and Congo red using Mg-Co ferrite powder. J. Water Environ. Nanotechnol., 2022; 7(2): 170-179.
DOI: 10.22090/jwent.2022.02.005

INTRODUCTION

Water contamination is mainly caused due to toxic effluents drained by several chemicals, in agricultural and textile industries. It has been reported that about 25% of dyestuffs are discharged directly into the environment by the textile factory. Generally, wastewater generated by the textile industry contains a considerable amount of non-fixed dyes, especially azo dyes, and a huge amount of inorganic salts. Also contains several non-biodegradable substrates that could be harmful to the environment. Their toxicity, stability to natural decomposition, and persistence in the environment have been the cause of much concern to society and regulation authorities all around the world [1-4]. Environmental problems associated with toxic organic pollutants in water and air are the current issue to be solved for the development of a healthy environment.

Photocatalytic oxidation is one of the emerging

technologies for the decomposition of organic dyes such as Reactive black 5, Acid orange, Aniline yellow, Orange B, Methyl yellow, Methyl red, Methylene blue, Congo red & Methyl orange, etc. Azo dyes represent about one-half of the dyes used in the textile industry. Among azo dyes, Methyl Orange (MO) is highly water-soluble, even at very low concentrations, which hinders the penetration of light and therefore causes adverse effects on photosynthesis. Congo Red (CR) was the first synthetic dye that could dye cotton directly [5]. It is contained in wastewater effluents from the textile, printing and dyeing, paper, rubber, and plastics industries. CR is used in medicine as a biological stain and as an indicator since it turns from red-brown in a basic medium to blue in an acidic one. These are the different ways organic pollutants (dyes) continuously get added to water sources. The incomplete decomposition of organic pollutants may lead to the formation of more toxic byproducts than the parent pollutants. Therefore, to overcome such a problem, looking for a metal

* Corresponding Author Email: sdjchemsuk@gmail.com