



Study the effects of reaction parameter on degradation of janus green B by using nano zinc oxide loaded on activated carbon

Pham Quang Minh¹, Nguyen Thi Van², Vu Anh Tuan^{2,*}

¹ Physical and chemical Department, National Institute for Control of Vaccine and Biologicals, Vietnam

² School of Chemical Engineering, Hanoi University of Science and Technology, Hanoi, Vietnam

*Email: tuan.vuanh@hust.edu.vn

ARTICLE INFO

Received: 03/7/2018

Accepted: 21/7/2018

Keywords:

Photodegradation, Zinc Oxide, Activated Carbon, Rice Husk, Janus Green B

ABSTRACT

In this study, zinc oxide nano particles loaded on activated carbon (ZnO/AC) has been successfully prepared for degradation of Janus Green B (JGB) under low UV light intensity. The activated carbon (AC) was synthesized from rice husk by two steps calcination at 800 °C, ZnO/AC was synthesized by hydrothermal method with the assistant of HMTA. As-prepared samples were characterized by XRD, FE-SEM, N₂ adsorption/desorption. The effects of operational parameters on the photo-degradation reaction progress, including catalyst dosage, initial dye concentration, initial pH value and the addition of inorganic anions were investigated in detail. In addition, the photodegradation rate of JGB on composite was evaluated by using the pseudo-first-order model.

Introduction

Urbanization and heavy industrialization caused our environment polluted seriously. It is a global menace to man's health and the magnitude of it is increasing day by day. Especially, wastewater released from dyeing industries is one of the main pollution sources. Up to now the environmental remediation technologies, including adsorption, biological oxidation, chemical oxidation, and incineration, have been used to treat all types of organic and toxic wastewater [1]; therein one of the typical environmental remediation methods is chemical degradation.

In chemical methods, semiconductor photocatalysis has emerged as one of the most promising processes for waste water treatment as compared to other conventional techniques [2]. Because it can be completely oxidized, easy to operation and low cost.

As one of the most important semiconductor photocatalysts, ZnO has attracted considerable interest

because of its high photosensitivity and stability [3]. However, the use of ZnO powders has many difficult problems such as separating the powder from the solution after completing the reaction, aggregation of particles in suspension at high loading, and difficulty in application to continuous flow systems [4]. Fortunately, these disadvantages of ZnO are avoidable through the process of surface modification and this can be achieved by coating ZnO particles by support materials like activated carbon and silica.

Rice husk is a by-product of the rice milling process, which is the outer covering of the rice grain, most of the rice husk is usually either dumped or burned in open spaces, thus causing damage to the land and environmental pollution. Much efforts have been made to utilize the rice husk including as an alternative fuel for energy production, production of activated carbon (AC) and as a raw material for manufacture of industrial chemicals based on silica and silicon compounds [5]. In there, AC has porous structure, high