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Generalized RBF artificial neural network applied to a reactive dyes photodiscoloration prediction problem

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ABSTRACT

This study describes the application of TiO_2, Fe/TiO_2 and Ni/TiO_2 (2 and 5% wt) using the sol-gel method for the reactive dyes discoloration under artificial and solar light. Adsorption of nitrogen, scanning electron microscopy with energy-dispersive X-ray, temperature-programmed reduction, and X-ray diffraction characterization techniques were used in this work. Fe and Ni addition, as well as the different temperatures employed for calcination, have exercised influence over dyers photodiscoloration, which has come to 97% under artificial irradiation during a reaction time of 7 h and 75% with solar light during a reaction time of one hour. An artificial neural network (ANN) model known as radial basis function (RBF) has been proposed for the prediction of the photodiscoloration for reactive dye solutions. This paper also examines the comparison between the proposed model and two other different ANN models for the same task. The input parameters to the algorithm were dye reactive, light source, dopant metal, metallic charge, calcination temperature and reaction time, and the output was dye discoloration. The proposed RBF-ANN model efficiently predicted the discoloration. Its result in terms of root mean squared error was 92.0767%, which gave satisfactory results with the experimental data overcoming the other two models.

Keywords: Sol-gel method; Photocatalysis; Characterization; Radial basis function neural network

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