Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
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OPTIMIZATION OF PHOTOCATALYTIC ACTIVITY OF Mg/ZnO NANOPARTICLES IN THE REMOVAL OF A MODEL CONTAMINANT USING RESPONSE SURFACE METHODOLOGY

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Abstract

In this study, Mg-doped ZnO nanoparticles were synthesized by sol-gel method. The structure and morphology of the nanoparticles were characterized by XRD and SEM, BET and DRS techniques. XRD pattern showed that the doped nanoparticles had the same crystal structure as pure ZnO nanoparticles. From SEM image, it was found out that the nanoparticles had spherical topography. BET analysis revealed that in comparison with pure ZnO, Mg/ZnO nanoparticles had a higher specific surface area. Based on DRS analysis, Mg/ZnO nanoparticles shifted to a lower wavelength (blue-shift), showing a high photocatalytic activity. The central composite design under the response surface methodology (RSM) was used for optimization of the photocatalytic removal of Rhodamine B (RhB) with Mg/ZnO nanoparticles. The results showed that there was a good agreement between the predicted data from RSM and the experimental data with a correlation coefficient of 0.9354. The determined optimum values for removal of RhB were as follows: Mg/ZnO nanoparticles dosage of 500 mg L^{-1}, initial RhB concentration of 6 mg L^{-1}, the irradiation time of 6 min, and pH = 8. In order to get more information about photocatalytic activity of the prepared Mg/ZnO nanoparticles, a comparison was made between the photocatalytic activity in this study and that reported by other researchers. The results revealed the synthesized Mg/ZnO nanoparticles had considerable photocatalytic activity.

Key words: Mg/ZnO, photocatalytic activity, Rhodamine B, response surface methodology

Received: October, 2014; Revised final: June, 2015; Accepted: June, 2015

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