

The effect of iron doping on ZnO catalyst on dye removal efficiency

Abstract

Dyes often being use in many manufacturing processes. Hence, the wastewater resulted from the manufacturing process contain colour which need to be removed before being emitted into any water bodies. Photocatalysis is a method which effectively treating wastewater using photocatalyst. ZnO is an example of semiconductor material which is use as a photocatalyst in the treatment method. Doping with transition metals can improve its properties to maximize its photocatalytic efficiency. In this study, the effect of zinc oxide (ZnO) and zinc oxide doped Fe (ZnO/Fe) photocatalyst for dye removal efficiency were investigated. The photocatalysts were successfully synthesized through sol-gel method and characterized by SEM, FTIR and EDX. The photocatalytic efficiency of ZnO and ZnO/Fe was studied by degrading methylene blue (MB) under the exposure of 3 hours of sunlight with varies operational condition. Optimal photocatalytic efficiency operating parameters were performed by Design Expert 10 using the Response Surface Method (RSM). ZnO appeared as regular shape compared to ZnO/Fe which most of the particles had clumped together. The removal efficiency of MB was increase when the dosage of catalyst increased. However, once the optimum dosage of catalyst exceeded, the removal efficiency of MB reduced. During the experiment, 30 mg of ZnO was capable to remove 90% of MB from the solution. When while, ZnO/Fe exhibited better result as it could remove up to 95% of MB using only 10 mg of ZnO/Fe during the treatment. It can be concluded that doping the ZnO with Fe could improve the catalytic ability of ZnO to degrade MB in wastewater.