

ABSTRACT

The Fenton process was introduced and used effectively to reduce organic compounds, including dyes, from industrial waste. Fe_3O_4 -zeolite composite performance and durability as Fenton catalyst to decolorizing methylene blue, were evaluated using response surface methodology (RSM) with three variables including catalyst doses, H_2O_2 concentrations and pH. Zeolite was synthesized via the sol-gel method while its composite was synthesized via coprecipitation. The catalysts were characterized with XRD, SEM-EDX, GSA, DRS-UV and FTIR. The highest decolorization of the design reaches up to 98% with optimum degradation conditions which are 430,28 mg/L of catalyst and 8 mM H_2O_2 under pH 3 solutions. Based on ANOVA analysis, the proposed RSM design adopting a quadratic model with R^2 0,96 and R^2_{pred} 0,94 shows that the design allows a good prediction between variable ranges with pH, catalyst concentrations and interactions between catalyst concentrations and H_2O_2 concentrations significantly affect the responses. The degradation kinetics of methylene blue via photo-Fenton reaction agreed with the BMG (Behnajady-Modirshahla-Ghanbary) model. Composite has a good reusability with only a 4% decrease in decolorization after five cycles. However, based on FTIR results, it noted that there is structural change after the reusability test, making the composite better for repeated use with regular replacement.

Keywords: Optimization, Fenton, RSM, Zeolite, Fe_3O_4