Photo-Fenton Decolorization of Methylene Blue Adsolubilized on Co2+ - Embedded Alumina Surface: Comparison of Process Modeling through Response Surface Methodology and Artificial Neural Network

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Abstract: In the present study, Co(II)-adsolubilized surfactant modified alumina (SMA) was prepared, and methylene blue (MB) degradation was carried out on Co-SMA surface by visible light photo-Fenton process. The entire reaction proceeded on solid surface as MB was embedded on Co-SMA surface. The reaction followed zero order kinetics. Response surface methodology (RSM) and artificial neural network (ANN) were used for modeling the decolorization of MB by photo-Fenton process as a function of dose of Co-SMA (10, 20 and 30 g/L), initial concentration of MB (10, 20 and 30 mg/L), concentration of H2O2 (174.4, 348.8 and 523.2 mM) and reaction time (30, 45 and 60 min). The prediction capabilities of both the methodologies (RSM and ANN) were compared on the basis of correlation coefficient (R2), root mean square error (RMSE), standard error of prediction (SEP), relative percent deviation (RPD). Due to lower value of RMSE (1.27), SEP (2.06) and RPD (1.17) and higher value of R2 (0.9966), ANN was proved to be more accurate than RSM in order to predict decolorization efficiency.

Keywords: adsolubilization, artificial neural network, methylene blue, photo-fenton process, response surface methodology

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