

Photo-Fenton Decolorization of Methylene Blue Adsorbed 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)-adsorbed 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 adsorbed 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 : adsorption, artificial neural network, methylene blue, photo-fenton process, response surface methodology

Conference Title : ICEESD 2017 : International Conference on Energy, Environment and Sustainable Development

Conference Location : Paris, France

Conference Dates : January 23-24, 2017