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Use of titanate nanowires for treatment of polluted water: Experimental investigation and optimization

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The present article surveys the significant applications of RSM in modern experimental design combined with photocatalytic degradation processes. The photocatalytic degradation of methylene blue dye (MB) was studied using Titanate nanowires under UV light in a tubular reactor. Titanate nanowires were synthesized with solvothermal reaction to investigate the effect of the co- solvent on the morphology and the properties of Titanate nanostructures. The parameters studied are catalyst dosage, initial concentration of dye and pH of the reaction mixture. The degradation of dye was found to be effective in the range: catalyst dose 0.10, 0.15, 0.20 g catalyst/400mL of dye solution; initial dye concentration 5, 10, 15 ppm and pH of reaction mixture 1.4, 7, 12.6. The Box– Behnken design of experiment technique was used. The results of the experiments were fitted to two quadratic polynomial models developed using the Response Surface Methodology (RSM), representing functional relationship between the percentage degradation of methylene blue dye and the experimental parameters. Design Expert software version V.6.0.7 (Stat- Ease Inc., USA) was used to optimize the effects of the experimental parameters on the responses. The optimum values of the parameters were: dose of Titanate nanowires is 0.16 g/ 400ml; initial concentration of MB 8.63 ppm and pH of reaction mixture 12.60. Under the optimal conditions the predicted percentage degradation of MB was 97. 9854%. Regression analysis with R2 value of 0.9988 showed goodness of fit of the experimental results with the predicted values.

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