



Optimization of separation phases of activated carbon by hydrocyclone process on using response surface methodology

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ABSTRACT

The aim of this study is to build an efficient hybrid treatment process for the depollution of mixed and highly polluted industrial textile wastewater. The proposed system consists of an effective coupling between adsorption by activated carbon and a phase separation by a hydrocyclone. The response surface methodology using the Box–Behnken experimental design was applied and explored in order to optimize the most influencing factors. The experimental results showed that the decolorization efficiency (CR%) by activated carbon for Novacron Blue 4R (NB4R) dye was 87.15% under optimal treatment conditions with a pH of 11, a concentration of carbon of 12.42 g/L and an initial dye concentration of 62.50 mg/L. The optimization study of separation of activated carbon by the hydrocyclone allowed a separation efficiency (ES%) about 88.74%. The cited efficiency was ensured in the optimal conditions which were a volume flow rate of 81.83 L/min, a carbon concentration of 12.42 g/L with a size of 0.5 m. The proposed hybrid process is shown to be more efficient in terms of treatment efficiency and recovery of the carbon particles. In addition, big improvements were reached especially in the term of the final wastewater quality after adsorption/hydrocyclone combination when compared with the current conventional treatment method in the concerned industry.

Keywords: Hydrocyclone; Activated carbon; Optimization; Response surface methodology; Industrial wastewater

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