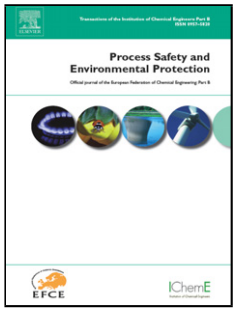

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Response surface methodological analysis for the optimization of acid-catalyzed transesterification biodiesel wastewater pre-treatment using coagulation-flocculation process

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Highlights

- Coagulation-flocculation process is the most favourable for a treatment of highly polluted biodiesel wastewater.
- Optimum conditions of coagulation-flocculation process can be obtain using Box-behnken design.
- Response Surface Methodology (RSM) helps to predict optimum removal efficiency and optimize the process conditions.

Abstract

Biodiesel wastewater is known as one of the most highly polluted wastewaters with high organic load, high amount of oils and fat contents and other compound such as chloride. The aim of this study is to optimize the coagulation-flocculation process prior to pre-treat biodiesel wastewater. This paper reports the optimal process conditions which were obtained using the Response Surface Methodology (RSM) analysis. This study was done using jar test apparatus. The Box-Behnken design was demonstrated beforehand to optimize this process. The investigated operating variables were coagulant dosage, initial pH, rapid mixing rate and contact time. The optimal process conditions obtained were alum dosage of 2 g/L, initial pH of 7.13, rapid mixing rate of 200 rpm and settling time of 65 minutes. From the validation test conducted, the results were in reasonable agreement with the modelled values. The coagulant used in this study managed to reduce the COD, SS and turbidity contents by 34.5, 39.0 and 32.0%. respectively. Optimization of coagulation-flocculation can be done using the Response Surface Methodology (RSM) analysis and this proving that coagulation is capable of pre-treating biodiesel wastewater.

Keywords: Biodiesel; Optimization; Alum coagulant; Jar test; Response Surface Methodology (RSM) method; Box-behnken design