Application of response surface methodology to optimize coagulation–flocculation treatment of anaerobically digested palm oil mill effluent using alum

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ABSTRACT

The purpose of this research was to investigate further treatment of anaerobically treated palm oil mill effluent (POME) via optimized coagulation–flocculation process. Alum, as a metal salt coagulant was used in the process. Most favourable values of pH, alum dosage, and slow mixing time were obtained using the central composite design and response surface methodology (RSM). Results show the regression, linear, interaction, and quadratic terms are significant and the model is considered to be adequate in terms of reproducibility. The quadratic model was significance to give less than 0.05 of probability of error (p). Also, the values of the correlation coefficient ($R^2$), adequate precision (AP), and coefficient of variance (CV) was found to be 0.962, 15.726 and 7.31, respectively. After operating of coagulation process in optimum condition (pH = 6.4, alum dosage = 2124 mg/L, and slow mixing = 20 min.) the chemical oxygen demand (COD) reduced by 59%. This indicates that the application of optimized coagulation–flocculation process decreases the COD concentrations level less than the POME discharge limits enforced by Department of Environment.

Keywords: Palm oil mill effluent; Coagulation; COD; Alum; RSM

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