Optimization of coagulation–flocculation process for combined sewer overflow wastewater treatment using response surface methodology

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\textbf{ABSTRACT}

A different type of combined sewer overflow (CSO) problem in dry weather, with characteristic of high organic pollutant loads and wide variations, has been becoming one of the most serious urban river pollution problems in China. The performance of coagulation–flocculation process in this type of CSO wastewater treatment was investigated in this study, using polyaluminum ferric chloride sulfate (PAFCS) as coagulant. A $2^3$ full-factorial central composite design and response surface methodology were applied to evaluate the effects and interactions for the chemical oxygen demand (COD) removal efficiency by three factors including initial COD concentration, initial suspended solid concentration, and coagulant dosage. A quadratic model was obtained and the analysis of variance results indicated clearly that experimental data could fit the equation well with a $R^2$ of 95.15%. There is a significant interaction between the initial COD concentration and coagulant dosage for COD removal efficiency. The experimental data and model predictions agreed well. The quadratic model was demonstrated to be an appropriate approach in prediction of the coagulant dosage or COD removal efficiency in this type CSO wastewater treatment using coagulation–flocculation process.

\textit{Keywords:} Combined sewer overflow; Coagulation–flocculation process; Quadratic model; Response surface methodology