Journal of Water Process Engineering, vol. 1, 2014, pages 8-16

COD removal from anaerobically treated palm oil mill effluent (AT-POME) via aerated heterogeneous Fenton process: Optimization study

Abstract

Due to the extremely high content of organic pollutants, palm oil mill effluent (POME) requires multiple stages of treatment. At the primary stage, because of the high loading of organics, anaerobic treatment method was found to be the best practice nowadays. However, at the later stages, the treatment methods vary. As an option to available secondary and tertiary treatment method, we used an aerated heterogeneous Fenton process to remove chemical oxygen demand (COD) from anaerobically treated palm oil mill effluent (AT-POME). The Box-Behnken design (BBD) and response surface method (RSM) were used to design and optimize the performance of the process. Furthermore, the regression quadratic model representing the COD removal efficiency of aerated heterogeneous Fenton was developed and validated by the analysis of variances (ANOVA). The optimum parameters were determined as 3.91g/l of nZVI dosage, 1.84g/l of H2O2 dosage, and 23.84l/h of aeration and 240min of reaction time. As 75% of COD was predicted to be removed at the optimum condition, the aerated heterogeneous Fenton process is a promising treatment method for AT-POME.

Keywords

Anaerobic digestion; Fenton process; Nano zero-valent iron (nZVI); Palm oil mill effluent (POME)