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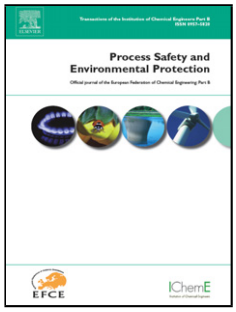

Title: Assessment of effective parameters in landfill leachate treatment and optimization of the process using neural network, genetic algorithm and response surface methodology

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Assessment of effective parameters in landfill leachate treatment and optimization of the process using neural network, genetic algorithm and response surface methodology

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Highlights:

- $FeCl_2$ was introduced as appropriate catalyst compared to $FeSO_4$ using AHP method (64% vs. 36%).
- Response surface methodology and neural network along with genetic algorithm were used to introduce models and optimum conditions.
- 3. Effective parameters for COD removal, SIR and ORSR were considered.
- Both RSM and GA methods proposed the same optimum values for pH, $[H_2O_2]/[Fe^{2+}]$ and $[Fe^{2+}]$.
- 4. The general relation for BOD/COD enhancement is:
  $(\frac{BOD_5}{COD})_{ultimate} = 1.2355(\frac{BOD_5}{COD})_{initial} + 0.2481.$

Abstract

In this paper, the Fenton process was found to be an effective technique to treat leachates when the drawbacks of this process were minimized by choosing proper catalyst, considering effective parameters and introducing optimum conditions. Analytic hierarchy process (AHP) was used to select the favorable catalyst between $FeSO_4$ and $FeCl_2$. Meanwhile, central composite design was used for test design of the experiments along with response surface methodology (RSM) and artificial neural network (ANN) for modeling. The effective variables included pH, $[H_2O_2]/[Fe^{2+}]$, Fe^{2+} dosage and initial COD concentration while removal COD, sludge to iron ration (SIR) and organic removal to sludge ration (ORSR) were considered as targets. For all three targets, the effective factors were considered using sensitivity analysis. Finally, response surface methodology and genetic algorithm (GA) were used for optimization of the process. According to AHP sensitivity analysis results, priority percentage for $FeCl_2$ and $FeSO_4$ were 64% and 36%, respectively. Comparing RSM and ANN, it was found that ANN

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