Coagulation–flocculation process for landfill leachate pretreatment and optimization with response surface methodology

Yosr Smaoui\textsuperscript{a,}\textsuperscript{*}, Moncef Chaabouni\textsuperscript{b}, Sami Sayadi\textsuperscript{c}, Jalel Bouzid\textsuperscript{a}

\textsuperscript{a}Laboratoire Eau, Energie et Environnement, Ecole Nationale d’Ingénieurs de Sfax, Université de Sfax-Tunisie, PB 1173, 3038 Sfax, Tunisia, Tel. +216 26 172 206; Fax: +216 74 665 190; email: smaoui.yosr@yahoo.fr (Y. Smaoui), Tel. +216 58 413 488; Fax: +216 74 665 190; email: bouzid.jalel@gmail.com (J. Bouzid)

\textsuperscript{b}Laboratoire de Chimie Industrielle, Ecole Nationale d’Ingénieurs de Sfax, Université de Sfax-Tunisie, PB 1173, 3038 Sfax, Tunisia, Tel. +216 22 96 07 88; Fax: +216 74 874 452; email: chabmoncef@yahoo.fr

\textsuperscript{c}Laboratoire des Bioprocédés Environnementaux, Pole d’excellence régionale ALIF, (PER-LBP), Centre de Biotechnologie de Sfax, BP 1177, 3061 Sfax, Tunisia, Tel. +26 41 95 43; Fax: +216 74 871 816; email: sami.sayadi@cbs.rnrt.tn

Received 12 January 2015; Accepted 22 June 2015

ABSTRACT

The present paper aimed to characterize and treat a landfill leachate using a coagulation–flocculation process. The leachate was obtained from a landfill in the city of Sousse, Tunisia. Its physicochemical characterization showed high levels of chemical oxygen demand (COD), ammonium, and heavy metal contents. The coagulation–flocculation process was applied as pretreatment effluent to reduce these pollutants. The key operating parameters (pH, coagulant dose, flocculant dose, and mixing speed in the flocculation step) on the coagulation–flocculation process were optimized using response surface methodology to investigate COD removal in landfill leachate. In this regard, a hybrid design was carried out to seek optimal conditions which were as follows: pH: 3.36; concentration of coagulant: 0.87 g/l; concentration of flocculant: 26 mg/l; and mixing speed: 48 rpm. These conditions have been proved experimentally.

Keywords: Landfill leachate; Pollutants; COD removal; Coagulation–flocculation; Response surface methodology; Hybrid design

*Corresponding author.

1944-3994/1944-3986 © 2015 Balaban Desalination Publications. All rights reserved.