Utilizing aluminum etching wastewater for tannery wastewater coagulation: performance and feasibility

Kerem Gungor\textsuperscript{a}, Nusret Karakaya\textsuperscript{a}, Yalcin Gunes\textsuperscript{b}, Sinan Yatkin\textsuperscript{b,c}, Fatih Evrendilek\textsuperscript{a,*}

\textsuperscript{a}Department of Environmental Engineering, Abant Izzet Baysal University, 14280 Bolu, Turkey, Tel. +90 374 254 1000; Fax: +90 374 253 4558; emails: gungor_k@ibu.edu.tr (K. Gungor), karakaya_n@ibu.edu.tr (N. Karakaya), fevrendilek@ibu.edu.tr (F. Evrendilek)
\textsuperscript{b}Department of Environmental Engineering, Namik Kemal University, 59850 Tekirdag, Turkey, Tel. +90 282 250 2324; Fax: +90 282 250 9924; email: ygunes@nku.edu.tr (Y. Gunes), Tel. +1 530 752 4231; Fax: +1 530 752 0952; email: syatkin@ucdavis.edu (S. Yatkin)
\textsuperscript{c}Crocker Nuclear Laboratory, University of California, Davis, CA 95616, USA

Received 16 August 2014; Accepted 11 January 2015

ABSTRACT

The main objective of this study was to investigate the feasibility of utilizing etching wastewater (EW) of aluminum (Al) coating industry as an alum substitute in industrial wastewater treatment. Our hypothesis was that Al-rich EW could be an effective substitute for commercial liquid alum used in a nearby (<10 km) tannery wastewater treatment plant (Corlu, Turkey). Bench-scale alum and EW jar tests along with an economic analysis were performed to test this hypothesis. Jar test results conducted using identical pH and Al doses showed that Al-rich EW performed similar to alum in terms of chemical oxygen demand (COD), suspended solids (SS), and turbidity removal. Regardless of its origin (alum or EW), 1 g of Al approximately removed 30 g COD and 20 g SS via a combined effect of coagulation and plain settling. Commercial alum and EW removed more than 95% of COD and turbidity; 60% of total COD from the tannery wastewater. Preliminary cost analysis showed that coagulant expenditure could be reduced by 40% if alum was substituted with EW.

Keywords: Aluminum industry; Etching spent liquor; Coagulant; Cost effectiveness; Jar test; Wastewater treatment

*Corresponding author.

Presented at the 2nd International Conference on Recycling and Reuse (R&R2014), 4–6 June 2014, Istanbul, Turkey

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