Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2017.21432

92 (2017) 128–133
October

Biodegradation and fate of linear alkylbenzene sulfonate in integrated fixed-film activated sludge using synthetic media

Hadi Eslami[a], Mohammad Reza Samaei[b], Ebrahim Shahsavani[c], Ali Asghar Ebrahimi[a,*]

[a]*Environmental Science and Technology Research Center, Department of Environmental Health Engineering, Shahid Sadoughi University of Medical Sciences, Yazd, Iran, Tel. +98 35 38209100-14; Fax: +98 35 38209111; emails: ebrahimi20007@gmail.com, ebrahimi20007@ssu.ac.ir (A.A. Ebrahimi), hadieslami1986@yahoo.com (H. Eslami)*
[b]*Department of Environmental Health Engineering, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran, email: mrsamaei@sums.ac.ir*
[c]*Research Center for Social Determinats of Health, Jahrom University of Medical Sciences, Jahrom, Iran, email: eshahsavani@yahoo.com*

Received 18 February 2017; Accepted 16 September 2017

ABSTRACT

Linear alkylbenzene sulphonate (LAS) is widely used for household and industrial purposes while influencing negatively on the environment. Present paper aimed to study LAS biodegradation among different loading rates and fate of LAS in integrated fixed-film activated sludge (IFAS) using synthetic media. A synthetic wastewater among three LAS loading rates with LAS concentrations of 5, 12 and 20 mg/L was investigated within an operative period of 111 d. In doing so, a kinetic model was developed to explain the biodegradation rate of LAS. Finally, the obtained data were analyzed by analysis of variance statistical test. The mean removal efficiency of LAS among three LAS loading rates were 92.32% ± 2.81%, 95.55% ± 2.74% and 96.22% ± 2.74%, respectively. Nevertheless, in terms of total removal efficiency of LAS, the contributions of LAS biosorption in sludge among the three LAS loading rates were 21.3%, 34.2% and 48.5%. The mean removal efficiency of chemical oxygen demand (COD) in among three LAS loading rates were 92.17% ± 4.32%, 91.53% ± 3.34% and 90.91% ± 2.98%, respectively. Moreover, the higher LAS loading rate, the higher removal efficiency of LAS ($p \leq 0.001$) and the lower COD removal efficiency ($p \leq 0.001$). The results of Michaelis–Menten model for biodegradation kinetics showed that the LAS biodegradation follows the first-order reaction kinetics ($R^2 = 0.9949$). In addition, biodegradation kinetic and removal efficiency of LAS showed that following the increased concentration of LAS among different loading rates, the LAS biodegradation rate was increased. Therefore, IFAS system is argued to be applicable for wastewater treatment in low and high concentrations of LAS up to 20 mg/L.

Keywords: Biodegradation; Linear alkylbenzene sulphonate; Integrated fixed-film activated sludge; Synthetic media; Kinetic model

* Corresponding author.