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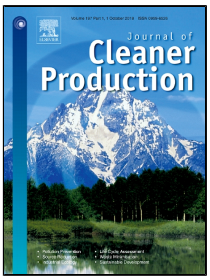

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PII:	S0959-6526(18)32344-8
DOI:	10.1016/j.jclepro.2018.08.013
Reference:	JCLP 13797
To appear in:	*Journal of Cleaner Production*
Received Date:	15 March 2018
Accepted Date:	01 August 2018

Please cite this article as: Somayyeh Dehghani, Abbas Rezaee, Saman Hosseinkhani, Biostimulation of heterotrophic-autotrophic denitrification in a microbial electrochemical system using alternating electrical current, *Journal of Cleaner Production* (2018), doi: 10.1016/j.jclepro.2018.08.013

Biostimulation of heterotrophic-autotrophic denitrification in a microbial electrochemical system using alternating electrical current

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Abstract

In this study, a novel integrated anoxic bioreactor with an electrochemical system was developed for heterotrophic-autotrophic denitrification using alternating current. The obtained results were revealed that sinusoidal and triangular waveforms were more effective than the square wave for enhancing the heterotrophic-autotrophic denitrification process efficiency. The nitrate removal efficiency was significantly decreased by increasing frequency ranges from 10 to 50 Hz. The system performance had an optimum response at 4 peak-to-peak voltage (Vpp). Nitrate reduction occurred at longer reaction times in higher voltage values (6, 8, and 10 $_{Vpp}$). It was demonstrated that both heterotrophic and autotrophic bacteria coexist in the heterotrophic-autotrophic denitrification bio-electroreactor induced by the alternating current. The most probable numbers were determined 5.2×10^6 and 5.2×10^4 for heterotrophic and autotrophic denitrification bacteria, respectively. *Pseudomonas* spp., *Nesterenkonia* spp., *Bacillus* spp., and *Brevibacillus* spp. were determined using 16S rRNA, as the most abundant denitrifiers present in the system. Accordingly, it is concluded that heterotrophic-autotrophic denitrification supplied with low-