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Title: Evaluation of direct and alternating current on nitrate removal using a continuous electrocoagulation process: Economical and environmental approaches through RSM

Author(s): Karamati-Niaragh, E (Karamati-Niaragh, Elnaz); Moghaddam, MRA (Moghaddam, Mohammad Reza Alavi); Emamjomeh, MM (Emamjomeh, Mohammad Mahdi); Nazlabadi, E (Nazlabadi, Ebrahim)

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Abstract: This study aims to investigate the effects of alternating current (AC) and direct current (DC) for nitrate removal and its operating costs by using a continuous electrocoagulation (CEC) process. For this purpose, two series of 31 experiments, which were designed by response surface method (RSM), were carried out in both cases of the AC and the DC modes. In each series, the effect of selected parameters, namely, initial nitrate concentration, inlet flow rate, current density and initial pH along with their interactions on the nitrate removal efficiency as well as its operating costs, as responses, were investigated separately. According to the analysis of variance (ANOVA), there is a reasonable agreement between achieving results and the experimental data for both responses. The nitrate removal in the AC mode was slightly more efficient than that of the DC mode. In addition, the average operating costs of the DC mode, including the energy and the electrode consumption for the CEC process were achieved 54 US\$/(kg nitrate removed); whereas this amount was calculated 29 US\$/(kg nitrate removed) for the AC mode. Therefore, the average of the operating costs was improved more than 40% using the AC mode, which was mainly related to reduction of aluminum electrode consumption.

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Addresses: [Karamati-Niaragh, Elnaz; Moghaddam, Mohammad Reza Alavi; Nazlabadi, Ebrahim] AUT, Civil & Environm Engr Dept, Hafez Ave, Tehran 158754413, Iran.

[Emamjomeh, Mohammad Mahdi] [Qazvin Univ Med Sci, Social Determinant Hlth Res Ctr, Qazvin, Iran.](#)

Corresponding Address: Moghaddam, MRA (corresponding author), AUT, Civil & Environm Engr Dept, Hafez Ave, Tehran 158754413, Iran.

E-mail Addresses: elnazkaramati@gmail.com; alavim@yahoo.com; m_emamjomeh@yahoo.com; ebrahim.nazlabadi@gmail.com

Author Identifiers:

Author	Web of Science ResearcherID	ORCID Number
Niaragh, Elnaz Karamati	AAJ-3924-2020	0000-0002-4050-4815
Alavi Moghaddam, Mohammad Reza		0000-0001-9924-5048

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