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Evaluation of amoxicillin antibiotic removal by electrocoagulation process from aqueous solutions: optimization through response surface methodology

Hosein Alidadi[a], Akram Ghorbanian[b,*], Mahdi Ghorbanian[c], Elham Rahmanzadeh[d], Nasrin Nemanifar[b], Marjan Mehrabpour[b,*]

[a]*Health Sciences Research Center, Department of Environmental Health Engineering, Mashhad University of Medical Sciences, Mashhad, Iran, email: alidadih@mums.ac.ir (H. Alidadi)*
[b]*Student Research Committee, Department of Environmental Health Engineering, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran, Tel. +98-51-38552610, Fax +98-51-38550611, email: ghorbaniana64@yahoo.com (A. Ghorbanian), N.Nemanifar@yahoo.com (N. Nemanifar), Tel. +98-51-38552610, Fax +98-51-38550611, email: marjanmehrabpour@gmail.com (M. Mehrabpour)*
[c]*Department of Environmental Health Engineering, Faculty of Health, North Khorasan University of Medical Sciences, Bojnord, Iran, email: ghorbanian82@gmail.com (M. Ghorbanian)*
[d]*Department of Occupational Health Engineering, Faculty of Health, North Khorasan University of Medical Sciences, Bojnord, Iran, email:e.rahmanzadeh@gmail.com (E. Rahmanzadeh)*

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ABSTRACT

In this research, electrocoagulation (EC) was studied to investigate the efficiency of amoxicillin (AMX) antibiotic removal using iron electrodes from aqueous solution. For this purpose, a central composite design (CCD) was employed to optimize the operating parameters including pH (2–12), current density (5–15 mA·cm^{-2}), AMX concentration (10–100 mg·L^{-1}), and electrode spacing (1–3 cm). Experiments were performed in batch mode at the constant time of 35 min. The residual concentration of AMX in samples was analyzed by measuring the AMX concentration through high-performance liquid chromatography (HPLC). Further, pollutant removal, sludge generation, and energy consumption were measured and discussed through response surface methodology (RSM). The results showed that the removal efficiency was achieved as 80.9% under optimized levels of parameters (pH: 7.87, current density: 10.17 mA·cm^{-2}, AMX concentration: 50 mg·L^{-1}, and electrode spacing: 1.5 cm), while sludge generation and energy consumption was 70.3 ml and 7.109 kWh·m^{-3}, respectively. The results revealed that at same conditions of all variables just one level reduction in current density has lead to the reduction to less than half of the energy consumption.

Keywords: Amoxicillin; Electrocoagulation; Response surface methodology; Optimization

*Corresponding author.

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