proceedings

MDPI

Abstract

Model Optimization of PPCP Removal from Simulated Wastewater via Electrocoagulation †

Wenkai Zhang, Jia Bao * and Yang Liu *

School of Environmental and Chemical Engineering, Shenyang University of Technology, Shenyang 110870, China; zwkbill@163.com

* Correspondence: baojia@sut.edu.cn (J.B.); liuyang@sut.edu.cn (Y.L.)

† Presented at the 1st International Electronic Conference on Toxics, 20–22 March 2024; Available online: https://sciforum.net/event/IECTO2024.

Keywords: diclofenac sodium (DCF); cefixime (CFX); response surface methodology (RSM); periodically reverse electrocoagulation (PREC); model optimization; removal mechanisms

1. Introduction

With the increasing presence of pharmaceuticals and personal care products (PPCPs) in aqueous environments, PPCPs have posed serious biological and environmental impacts and threatened human health. Due to their environmental persistence, bioaccumulation, and high toxicity, PPCPs cannot be effectively removed by conventional wastewater treatment techniques.

2. Methods

The present study focuses on the treatment of two typical PPCPs involving diclofenac sodium (DCF) and cefixime (CFX) via periodically reverse electrocoagulation (PREC) using Al-Zn electrodes, with an in-depth study on the treatment conditions and removal mechanisms. The aqueous samples were analyzed using a UV-vis spectrophotometer. Moreover, the response surface methodology (RSM) model was applied for the optimization and prediction of removal efficiency. In addition, the flocs produced by the reaction were analyzed by SEM-EDS, XRD, and Fourier transform infrared (FTIR) spectroscopy.

3. Results

The removal rates of DCF and CFX could reach 90.8% and 97.4%, respectively, after 50 min of treatment, with an initial concentration of 20 mg/L, a current intensity of 0.6 A, an initial pH of 7.0, and a stirring speed of 600 rpm. Through the optimization of RSM, the removal rates of DCF and CFX were increased to 93.7% and 98.8%, respectively. In addition, the flocs possessed significant adsorption capacity and interacted with the functional groups of DCF and CFX.

4. Conclusions

The present study demonstrated that the PREC technique can effectively remove PPCPs from wastewater and provide a strategy for optimizing the operating parameters.

Author Contributions: Conceptualization, J.B. and Y.L.; methodology, J.B. and Y.L.; software, W.Z.; validation, W.Z. and Y.L.; formal analysis, W.Z.; investigation, W.Z.; resources, J.B.; data curation, W.Z.; writing—original draft preparation, W.Z.; writing—review and editing, J.B. and Y.L.; visualization, W.Z.; supervision, Y.L.; project administration, J.B.; funding acquisition, J.B. and Y.L. All authors have read and agreed to the published version of the manuscript.

Citation: Zhang, W.; Bao, J.; Liu, Y. Model Optimization of PPCP Removal from Simulated Wastewater via Electrocoagulation. *Proceedings* **2024**, *102*, 42. https://doi.org/10.3390/proceedings2024102042

Academic Editor: Shaohu Ouyang

Published: 3 April 2024

Funding: This research was funded by the National Natural Science Foundation of China (No.21976124 and No. 21507092), Applied Basic Research Plan of Liaoning Province (No. 2023JH2/101300059), and Science and Technology Joint Foundation of Liaoning Province (No. 2023-MSLH-264).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare no conflict of interest.