

Accepted Manuscript

Abatement of Amoxicillin and Doxycycline in Binary and Ternary Aqueous Solutions by Gas-phase Pulsed Corona Discharge Oxidation

Alexander Sokolov, Matilda Kråkström, Patrik Eklund, Leif Kronberg, Marjatta Louhi-Kultanen

PII: S1385-8947(17)31786-2
DOI: <https://doi.org/10.1016/j.cej.2017.10.071>
Reference: CEJ 17855

To appear in: *Chemical Engineering Journal*

Received Date: 3 March 2017
Revised Date: 21 August 2017
Accepted Date: 14 October 2017

Please cite this article as: A. Sokolov, M. Kråkström, P. Eklund, L. Kronberg, M. Louhi-Kultanen, Abatement of Amoxicillin and Doxycycline in Binary and Ternary Aqueous Solutions by Gas-phase Pulsed Corona Discharge Oxidation, *Chemical Engineering Journal* (2017), doi: <https://doi.org/10.1016/j.cej.2017.10.071>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Abatement of Amoxicillin and Doxycycline in Binary and Ternary Aqueous Solutions**by Gas-phase Pulsed Corona Discharge Oxidation**

Alexander Sokolov¹, Matilda Kråkström², Patrik Eklund², Leif Kronberg², Marjatta Louhi-Kultanen^{1,3}

¹School of Engineering Science, Lappeenranta University of Technology, P.O. Box 20, FI-53850 Lappeenranta, Finland

²Johan Gadolin Process Chemistry Centre, Laboratory of Organic Chemistry, Åbo Akademi University, Biskopsgatan 8, 20500 Åbo, Finland

³School of Chemical Engineering, Aalto University, P.O. Box 16100, FI-00076 Aalto (Espoo), Finland

Abstract

The presence of pharmaceutical compound residues in water bodies is becoming an increasingly serious problem. Various pharmaceuticals have been detected in raw municipal wastewaters, after wastewater treatment plant processes, and even in drinking water. Many common pharmaceuticals are bio-accumulating and they can have a harmful impact on aquatic and terrestrial organisms.

In this work, pulsed corona discharge technology (PCD) is studied as a potential method for antibiotic compounds abatement. Two antibiotics, amoxicillin and doxycycline, were chosen as test pharmaceutical compounds. The aim of the study was to investigate the transformation kinetics of binary solutions (water - single antibiotic compound) and ternary solutions (water - two antibiotic compounds) of the compounds and to optimize operational parameters for improved oxidation performance. Ternary solutions were investigated to obtain data on transformation kinetics when two competing pharmaceutical molecules are present in the solution. The experiments showed that reactions of doxycycline oxidation are always first order reactions. Reaction of amoxicillin oxidation has second order in the case of experiments with binary solution in alkaline medium. In other cases, it has first order. The transformation products formed were identified and monitored based on liquid chromatography mass spectrometer analysis. OH-amoxicillin, amoxicillin pencilloic acid, OH-doxycycline and 2-OH-doxycycline had the largest peaks areas. All studied compounds and all transformation products can be easily oxidized by PCD. Approximately 1 kWh/m³ and 0.5 kWh/m³ delivered energy is enough for oxidation of great part of amoxicillin and doxycycline respectively. Low

Download English Version:

<https://daneshyari.com/en/article/6581055>

Download Persian Version:

<https://daneshyari.com/article/6581055>

[Daneshyari.com](https://daneshyari.com)