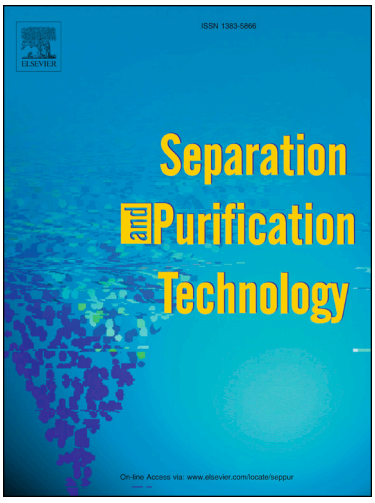

Radiolytic decomposition of sulfonamide antibiotics: implications to the kinetics, mechanisms and toxicity

Ning Liu, Wen-yuan Huang, Zhi-min Li, Hai-yang Shao, Ming-hong Wu, Jian-qiu Lei, Liang Tang

PII: S1383-5866(17)34290-9
DOI: https://doi.org/10.1016/j.seppur.2018.03.060
Reference: SEPPUR 14480

To appear in: *Separation and Purification Technology*

Received Date: 29 December 2017
Revised Date: 9 March 2018
Accepted Date: 26 March 2018

Please cite this article as: N. Liu, W-y. Huang, Z-m. Li, H-y. Shao, M-h. Wu, J-q. Lei, L. Tang, Radiolytic decomposition of sulfonamide antibiotics: implications to the kinetics, mechanisms and toxicity, *Separation and Purification Technology* (2018), doi: https://doi.org/10.1016/j.seppur.2018.03.060

Radiolytic decomposition of sulfonamide antibiotics: implications to the kinetics, mechanisms and toxicity

Ning Liu[a], Wen-yuan Huang[a], Zhi-min Li[a], Hai-yang Shao[b], Ming-hong Wu[b,*], Jian-qiu Lei[c], Liang Tang[b,*]

[a] School of Environment and Architecture, University of Shanghai for Science and Technology, Shanghai 200093, China

[b] School of Environmental and Chemical Engineering, Shanghai University, Shanghai 200444, China

[c] Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Shanghai 201800, China

* Corresponding authors at School of Environmental and Chemical Engineering, Shanghai University, Shanghai 200444, China. Tel: +86 21 66137801, e-mail: mhwu@shu.edu.cn (M. H. Wu); Tel: +86 21 66137508, e-mail: tang1liang@shu.edu.cn (L. Tang)

Abstract: Abuse of antibiotics and consequent formation of resistance genes has aroused public concerns on environmental issues. Herein, we employed electron beam (EB) approach to deal with three kinds of sulfonamides, for studying the treatment efficiency and removal mechanisms to these widely used drugs. The results suggested EB could efficiently decompose the parent compounds of sulfonamides, the degradation processes followed pseudo-first-order kinetics, and dose constant *k* decay exponentially with their initial concentration. The radiolysis efficiency of these sulfonamides with the sequence of sulfathiazole (STZ) > sulfamethoxazole (SMX) > sulfamethazine (SMZ). The highested decomposition efficiencies were achieved in purewater compared to tipwater and surfacewater solutions. Acidic solutions facilitated sulfonamides radiolytic decomposition. An appropriate amount of 5 mM H_2O_2 enhanced sulfonamides degradation. Removal efficiencies were also influenced by inorganic anions in the order of NO_2^->SO_3^{2-}> CO_3^{2-}>NO_3^->HCO_3^->Cl^->SO_4^{2-}. Hydroxyl radicals were the dominant species, which was proven by radical scavenging studies. Removal of total organic carbon and total nitrogen were also determined to evaluate the mineralization degrees of sulfonamides. The formation of three ionic products and the