INFLUENCE OF DIFFERENT PARAMETERS ON DEGRADATION EFFICIENCY OF ANTIBIOTIC DRUG CIPROFLOXACIN

Dušica Jovanović, Nina Finčur

University of Novi Sad Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Trg D. Obradovića 3, 21000 Novi Sad, Serbia
e-mail: nina.fincur@dh.uns.ac.rs

Abstract

The occurrence of pharmaceuticals in the environment in general, but specifically in the aquatic environment, can have a harmful impact on human health. Hence, it is crucial to prevent their release into the environment [1]. Photocatalysis occurs in the presence of light, i.e. photons of a specific wavelength, and photocatalyst [2]. Compared to other advanced oxidation processes, the process of photocatalytic degradation has proven to be more efficacious in the degradation of pollutants that are otherwise challenging to remove from the environment. Applying photocatalysis, organic pollutants can be degraded and completely mineralized to CO_2, H_2O, and corresponding inorganic ions as products that are less detrimental to the environment in comparison with initial molecules [3]. Ciprofloxacin (Figure 1) is a fluoroquinolone antibiotic commonly used both in human and veterinary medicine for treating various infectious diseases mainly caused by Gram-negative and some Gram-positive bacteria [4].

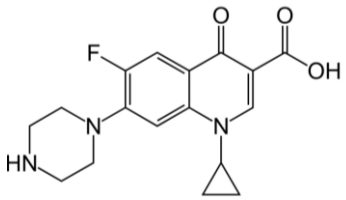

Figure 1. Structural formula of ciprofloxacin

In this research, we observed the influence of the nature of light on the efficacy of direct photolysis of ciprofloxacin in the commercial formulation (drug Ciprocinal), as well as extent of its photocatalytic degradation using ZnO as a photocatalyst, in the presence and absence of O_2. Furthermore, the influence of the catalyst loading and the effect of substrate initial concentration on the degradation rate of ciprofloxacin was also examined. The degradation kinetics was monitored by UFLC-DAD.

Acknowledgements

The authors acknowledge financial support of the Ministry of Education, Science and Technological Development of the Republic of Serbia (Grant No. 451-03-9/2021-14/200125).

References

[1] K. Kümmerer, in: K. Kümmerer (Ed.), Pharmaceuticals in the environment, Springer, Berlin, 2008, pp. 3.
[2] M.P. Callao, M.S. Larrechi, Data Handl. Sci. Technol. 29 (2015) 399.
[3] J. Zhang, B. Tian, L. Wang, M. Xing, J. Lei, Photocatalysis: fundamentals, materials and applications, Springer-Verlag, Singapore, 2018, pp. 1.
[4] Z. Vybíralová, M. Nobilis, J. Zoulova, J. Kvetina, P. Petr, J. Pharm. Biomed. Anal. 37 (2005) 851.