

Plasma assisted degradation of pharmaceuticals in water: propranolol hydrochloride as a model compound

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1 Introduction

Propranolol hydrochloride (PRO, Fig. 1), beta-blocker, is poorly degradable in wastewater treatment plants. Because of its wide use, it could pose a threat to aquatic organisms and water-users. [1]

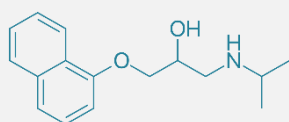


Fig. 1. Propranolol structure

2 Materials and methods

The non-thermal plasma reactor (Fig. 2) is tested for degradation of propranolol hydrochloride solution (100 ppm), using different gases under the same electrical conditions (35 W of power dissipated in plasma).

The concentration of PRO in samples was quantified using HPLC-DAD (213 nm), with acetonitrile and water (70/30 V/V) as eluents. The retention time of PRO was 5.100 min.

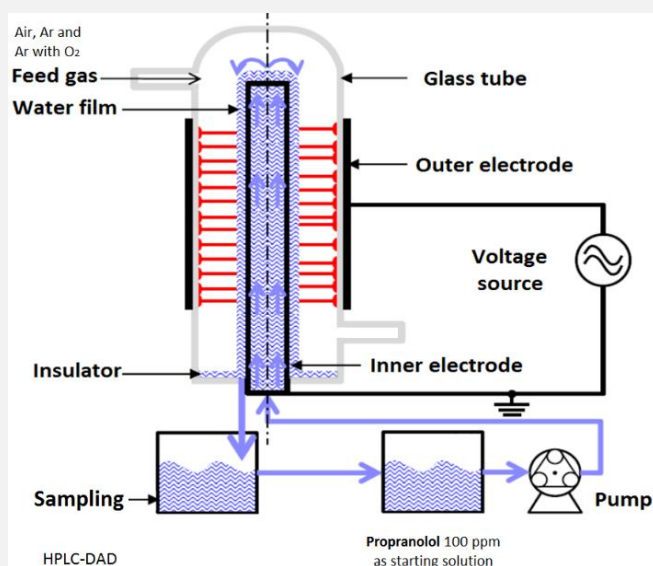


Fig. 2. Experiment scheme of propranolol hydrochloride solution degradation using non-thermal plasma reactor

3 Results and Discussion

The most successful propranolol hydrochloride degradation was achieved using **Ar with O₂** (80/20 V/V), applying 35 W of power dissipated in plasma, almost **80 %** in the 1st cycle of treatment (Fig. 3). The best results with air are slightly over 80 % but in the 10th cycle of plasma reactor treatment.

The presence of N₂ in the air decreases the availability of reactive oxygen species, as shown in [2].

4 Conclusions

This non-thermal plasma is successful at the degradation of organic pollutants in water, such as propranolol hydrochloride, under given conditions.

The level of propranolol hydrochloride degradation can be increased modifying the composition of feed gas, with best results using Ar with O₂.

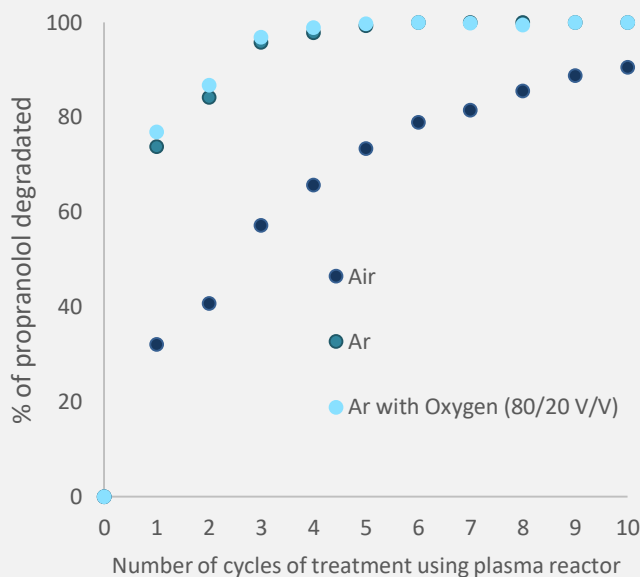


Fig. 3. Percentage of propranolol hydrochloride degradation as a function of number of cycles of treatment with non-thermal plasma reactor using air, argon and argon with oxygen

Acknowledgments

This study was supported by the Ministry of Education, Science and Technological development of the Republic of Serbia through projects 172030 and 171034.

References

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- [2] V. Kovačević *et al.* J. Phys. D: Appl. Phys. 2017, 50 (15). Measurement of reactive species generated by dielectric barrier discharge in direct contact with water in different atmospheres.