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BOOK OF ABSTRACTS

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GC/MS and TOC Analyses of Ibuprofen after Degradation in Waterusing Chlorine Dioxide

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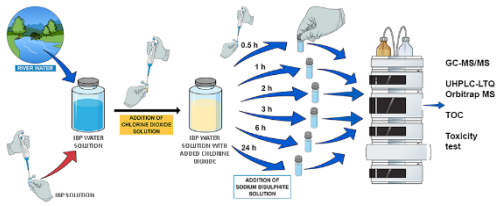

Figure 1. IBP degradation using ClO_2.

Drinking water and wastewater treatment facilities often have a chemical oxidationstep for disinfection, the removal of organic micropollutants, color removal and taste andodor control. Among the most commonly used oxidants are chlorine dioxide (ClO_2), chlorine, and ozone.ClO_2 has been increasinglyemployed as disinfectant in water treatment due to its antibacterial and antiviral properties. As a powerful oxidant, ClO_2 can remove many organic and inorganic pollutants [1,2].

The aim of the present study was to assess thepotential of ClO_2 to oxidize pharmaceutical during water treatment. Therefore, degradation of ibuprofen (IBP) using ClO_2in water was investigated.The degradation under different reaction conditions (concentration of ClO_2: 5, 10, 15 mg/L; concentration of ibuprofen: 10, 20, 35, 60 mg/L; reaction time: from 0.5 to 24 h; pH values: 3, 7, 10) was monitored using high performance liquid chromatography (HPLC) analysis, while mineralization degree was detemined by total organic carbon (TOC) measurements. The highest degree of IBPdegradation in deionized water was obtained by treatment with 15 mg/L ClO_2, using 10 mg/L ibuprofen, at pH = 10, after 24 h of treatment. The obtained degradation degree value under optimal conditions was 99%.

TOC analysis of ibuprofen showed reduction in content of organic carbon in the solution. Before degradation TOC content was 7.8 mg/L and after 5.6 mg/L. This showes that degradation and mineralization of ibuprofen occur during this process.

The degradation products obtained under optimal conditions were analyzed and confirmed by gas chromatography–mass spectra (GC–MS) and the reaction pathwayswere proposed.From GC chromatograms, degradation products of ibuprofen appeared at following retention times: 4.35 min, 5.12 min, 6.76 min, and 7.05 min. After the analysis of mass spectra, based on the spectral characteristics and the ratio of mass and charge (m/z), it was determined that there are four main degradation products of ibuprofen, after treatment with ClO2.The first characteristic ion appeared at 6.76 min and has m/z 163 (2-(4-methylphenyl) propionic acid). In further degradation path, two products are formed, one of which is a characteristic ion with m/z 57 (2-methylpropane) at 4.36 min, while the other product is further decomposed to give two new products, one of which is also a characteristic ion with m/z 57 (acetic acid) at 5.21 min. Another characteristic ion having m/z 161 (1-ethyl-4-isobutylbenzene) appeared at 7.05 min.

ClO2 treatment is an efficient method for IBP degradation.The findings of the present study are very useful for the treatment of drinking waters contaminated with pharmaceutical.

Acknowledgements

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References

[1] M. V. Pergal, I. D. Kodranov, B. P. Dojcinovic, V. V. Avdin, D. M. Stankovic, B. B. Petkovic, D. D. Manojlovic, *Environmental Science in Pollution Research*, 27 (2020)27147.

[2] M. V. Pergal, I. D. Kodranov, M. M Pergal, U. M Gasic, D. M. Stankovic, B. B. Petkovic, D. D. Manojlovic, *Water Air Soil Pollution,* 231 (2020)433.