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Irradiated-assisted electrochemical processes for the removal of persistent pollutants from real wastewater

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Abstract

In this work, it is studied the treatment of real wastewater (intensified with two target compounds) using electro-irradiated technologies. Two types of effluents coming from an organic-synthesis pharmaceutical industry and the outlet of a municipal wastewater treatment plant were intensified with metoprolol (β -blocker) and caffeine (stimulant), respectively. Conductive diamond electrochemical oxidation (CDEO), photolysis, sonolysis and all possible combinations among these technologies were evaluated for the treatment of both wastes. Results demonstrate that complete oxidation of the target compounds, as well as mineralization of the organic compounds contained in the matrixes, can be attained by all electro-irradiated technologies and no salt addition was needed to obtain an efficient treatment. Single irradiated technologies were inefficient in the oxidation but their combination with CDEO improves significantly the efficiency of the process showing clear synergistic effects. However, due to the large energy requirement of ultrasound irradiation, this combination is only cost-effective in the case of ultraviolet irradiation.

Key Words: Electrochemical oxidation, real wastewater, sonoelectrolysis, photoelectrolysis, caffeine, metoprolol.

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