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LEADING EDGE TECHNOLOGIES FOR THE REMOVAL OF EMERGING POLLUTANTS

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BOOK OF ABSTRACTS

Catalytic wet peroxide oxidation in the removal of emerging micropollutants

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Several contaminants of emerging concern (CECs), with negative impact on water security, have been recently identified and quantified in different water sources [1]. Among them, antibiotics are receiving particular attention due to the possible development of antibiotic resistant bacteria and/or resistance genes (ARB&ARG). Conventional urban wastewater treatment plants are unable to cope with most of these compounds, thus allowing their systematic propagation throughout the urban water cycle. The development of efficient and economically viable advanced treatment technologies, able to remove CECs from different water sources, is therefore a top priority in the policy agendas of several countries around the world. Under this context, catalytic wet peroxide oxidation (CWPO) appears as a promising low cost advanced oxidation process, characterized by its operation with simple equipment under mild conditions. Taking advantage of the recent improvements on catalyst design and application, the ability of CWPO to remove antibiotics from real water matrices was evaluated for the first time, using a set of novel magnetic carbon xerogels containing iron and cobalt microparticles embedded in their structure. Sulfamethoxazole (SMX) – an antimicrobial agent already associated to the development of ARB&ARG and typically found in (i) raw and conventionally treated urban wastewater, (ii) raw and conventionally treated drinking water, or (iii) surface and groundwater, was used as model of persistent micropollutant at the ppb level (500 $\mu g\ L^{-1}$). As a result of the improved catalyst performance, CWPO technology was able to efficiently remove SMX from conventionally treated urban wastewater and drinking water, with operation at room temperature and atmospheric pressure [2]. Afterwards, seeking the evaluation of the proposed catalytic process in a more realistic application, the CWPO was applied to the treatment of a hospital wastewater, containing a very complex mixture of natural and anthropogenic compounds. The results obtained are encouraging, with chemical oxygen demand and total organic carbon removals up to 96% and 73.4% respectively. The absorbance measured at 254 nm, wavelength characteristic of the aromatic content, was found to decrease 74.9% after 24 h of treatment. Effluent toxicity was also measured before and after treatment, revealing that the increase of temperature resulted in a decrease in toxicity.

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