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Novel hybrid magnetic carbon xerogels for the catalytic wet peroxide oxidation of the antimicrobial agent sulfamethoxazole

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The propagation of microcontaminants – such as the antimicrobial agent sulfamethoxazole (SMX) – in urban water cycles has been receiving a great deal of attention from the scientific community, mainly due to major public health concerns about the development of antibiotic resistant bacteria and/or resistance genes. Catalytic wet peroxide oxidation (CWPO) using novel hybrid materials was tested in the degradation of SMX model solutions (500 $\mu\text{g L}^{-1}$). Hybrid magnetic carbon xerogels were synthesized including different metal precursor salts during the preparation of the carbon xerogel (CX), which was obtained by polycondensation of resorcinol with formaldehyde¹. Thus, following the dissolution of Fe^{3+} , $\text{Fe}^{3+}/\text{Co}^{2+}$ and Co^{2+} precursors, CX/Fe, CX/CoFe and CX/Co were obtained, respectively. The performance of the catalysts was studied in batch experiments under atmospheric pressure, at room temperature (25 ± 2 °C), pH 3, catalyst load = 20 mg L^{-1} and $[\text{H}_2\text{O}_2]_0 = 500 \text{ mg L}^{-1}$. The highest CWPO removal of SMX is obtained in the presence of CX/CoFe (Figure 1a). The SMX removal obtained when using bare CX is similar, but in this case ascribed to adsorption of the pollutant (pollutant transfer rather than catalytic degradation). The concentration decay curves (Figure 1b) clearly show the high catalytic performance of CX/CoFe when applied in the CWPO of SMX.

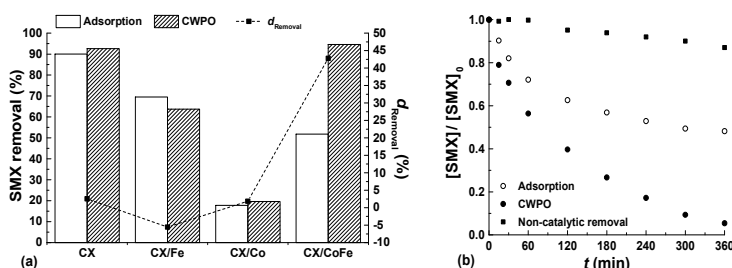


Figure 1. SMX removal in (a) adsorption and CWPO runs (bars/left axis) performed with the hybrid magnetic carbon xerogels, and respective difference due to H_2O_2 addition [d_{Removal} (squares/right axis)] and in (b) adsorption and CWPO runs performed with the CX/CoFe catalyst; non-catalytic results are also shown.

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Reference

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