In situ regeneration by H_2O_2 electro-generation of sol-gel carbon xerogel adsorbents used for micropollutants removal in water

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The process developed in this study is based on adsorption with carbon xerogels, coupled with *in situ* regeneration of the adsorbent by H_2O_2 electro-generation and its enhanced decomposition in ●OH radicals thanks to UV illumination. The *in situ* regeneration of the carbon materials aims at replacing the usual thermal regeneration, which is costly and degrades gradually the adsorption properties.

First, carbon xerogels were synthesized by sol-gel process and molded as 5x1 cm cylinders. Their physico-chemical properties such as their specific surface area, pore texture and surface composition, were determined. Then, the adsorption of three model pollutants on these carbon xerogel cylinders was performed. In parallel, the electro-generation of H_2O_2 within these cylinders illuminated by UV light, which aims at producing *in situ* a powerful oxidant capable of eliminating the adsorbed pollutant, was studied. Finally, *in situ* regeneration of saturated carbon cylinders was performed.

Cylindrical carbon xerogels were synthesized with four different pore sizes from resorcinol and formaldehyde with sol-gel process. Their adsorption properties towards three different model pollutants (*i.e.* methylene blue (MB), p-nitrophenol (PNP) and ibuprofen (IB)) were determined. Long-time exposure was performed to determine the adsorption kinetics and capacities for each case. Concentrations of pollutants higher than those commonly found for micropollutants in wastewater were selected in order to reach UV-visible spectroscopy detection levels.

Concerning H_2O_2 electro-generation, a constant concentration of H_2O_2 of 4 mg/L can be obtained at low current (0.1 A) with the best carbon material. Finally, first results showed that the regeneration of an PNP-saturated cylinder could be done in 5 h thanks to H_2O_2 electro-generated and UVA illumination.