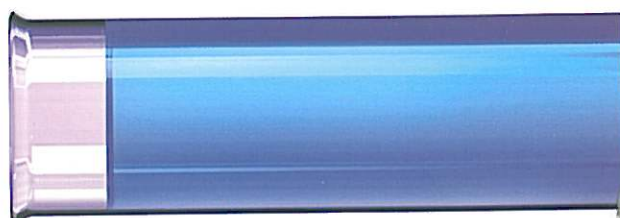
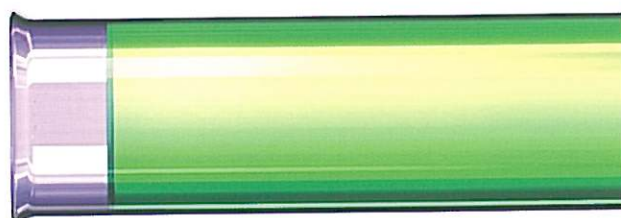
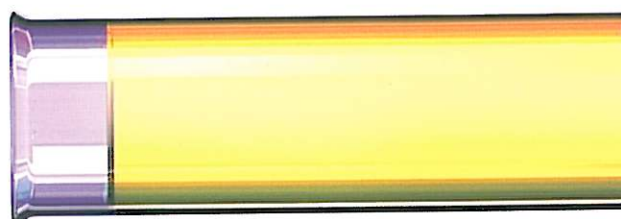
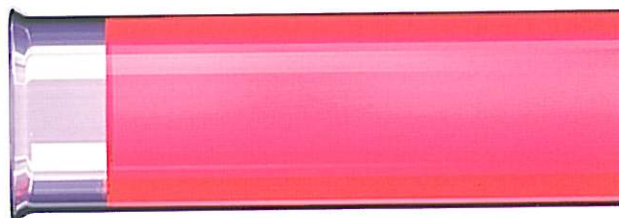


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Activated carbon xerogels for the removal of azo dyes by adsorption and catalytic wet peroxide oxidation

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Activated carbon (AC) is widely used as adsorbent in a variety of processes for water purification. Recently, we have shown that in the presence of hydrogen peroxide (H_2O_2), the AC can act as catalyst for the Catalytic Wet Peroxide Oxidation (CWPO) of organic substrates in aqueous solution^{1,2}. In the present work, AC xerogels (ACX) were tested for the removal of azo dyes in aqueous solution, either by adsorption or by CWPO. Two azo dyes were chosen as model pollutants – Orange II (OII) and Chromotrope 2R (C2R) – due to their anionic character and their extensive use in the textile industry. The activated carbon xerogels were produced by activation of an organic xerogel (RFX) synthesised by polycondensation of resorcinol with formaldehyde. Three different activation procedures were carried out producing five distinct catalysts: steam at 1073 K (ACX-S), chemical impregnation with H_3PO_4 at 773 K (ACX-P) and alkali activation with dry KOH at 973 K, using different mass ratios of KOH/RFX, 1:1 (ACX-K1), 2:1 (ACX-K2) and 4:1 (ACX-K4).

The experiments were performed in a 500 mL stirred glass reactor, heated by immersion in a water bath, loaded with 250 mL of the azo dye solution, with a concentration of 100 mg L^{-1} , considering $\text{pH} = 3$, $T = 303 \text{ K}$, $[H_2O_2] = 34.6 \text{ mmol L}^{-1}$ and adsorbent/catalyst load = 0.1 g L^{-1} .

The results show that the ACX-Ks are efficient adsorbents for both dyes (e.g., C2R adsorption removal up to $0.906 \text{ mmol g}^{-1}$ after 150 min for ACX-K4 – Fig. 1a) and that the added H_2O_2 enhances the removal of C2R to a further $1.307 \text{ mmol g}^{-1}$ (Fig. 1b). The superior adsorption and reaction performance of ACX-Ks, compared to the other activated carbon xerogels, may be explained by their strong basic character, which favours the interaction between the carbon materials surface and the anionic dyes.

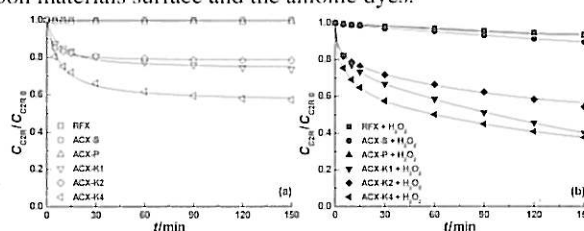


Fig. 1: Concentration decay curves obtained for the adsorption (a) and CWPO (b) removal of C2R using the synthesised carbon materials (0.1 g L^{-1}). Experiments at 303 K, $\text{pH} = 3$ and, in CWPO experiments, H_2O_2 concentration of 34.6 mmol L^{-1} .

Acknowledgments

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References

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