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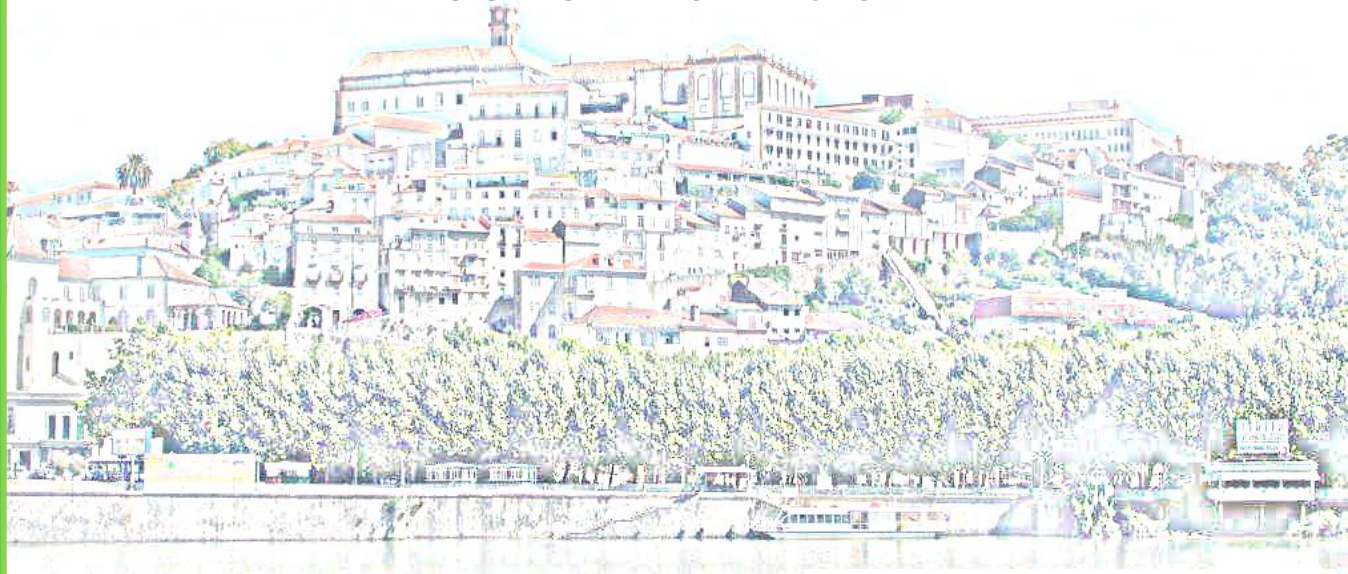
BOOK OF ABSTRACTS



SOCIEDADE PORTUGUESA DE QUÍMICA

P-19 MAGNETIC N-DOPED AND UNDOPED CARBON NANOTUBES AS CATALYSTS FOR WET PEROXIDE OXIDATION

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Magnetic Fe-containing N-doped and undoped carbon nanotubes (N-CNT and CNT, respectively) have been prepared and tested in the catalytic wet peroxide oxidation (CWPO) of 4-nitrophenol (4-NP; 5 g L^{-1}) at relatively mild operating conditions (atmospheric pressure, T = 50 ºC, pH = 3, catalyst/adsorbent load = 2.5 g L^{-1} and $[H_2O_2]_0$ = 17.8 g L^{-1}).

The experimental results reveal that CNT have low affinity for H_2O_2, due to their hydrophobic nature, resulting in a controllable and efficient H_2O_2 decomposition to $HO^{\bullet}$ and $HOO^{\bullet}$ radicals, the first step in CWPO reactions, enabling the catalytic removal of 99% of the pollutant in about 12 h (Figure 1). The marked pH decrease observed during the reaction suggests the degradation of 4-NP through the formation of short-chain carboxylic acids. In addition, since Fe is confined inside the CNT structure, it is protected to some extent from leaching into the solution, making this catalyst very attractive for CWPO applications coupled with *in-situ* magnetic separation systems for catalyst recovery.

On the contrary, N-CNT comprise hydrophilic sections in their structure, strongly increasing the affinity of the material towards polar molecules like H_2O_2, which are then quickly decomposed into non-reactive O_2 and H_2O species. This inefficient H_2O_2 decomposition leads to almost no catalytic removal of 4-NP when using N-CNT. In addition, this process may also be assisted by oxidation of the Fe present in the N-CNT structure, as higher Fe leaching was observed.

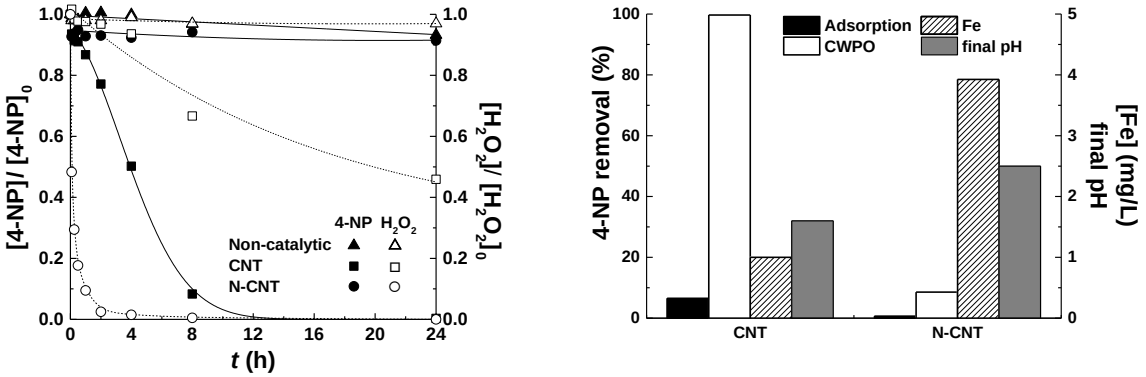

Figure 1: Concentration of 4-NP (solid) and H_2O_2 (open) during the CWPO experiments (left); 4-NP removal in adsorption and CWPO runs, Fe leaching and pH after 24 h (right).

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