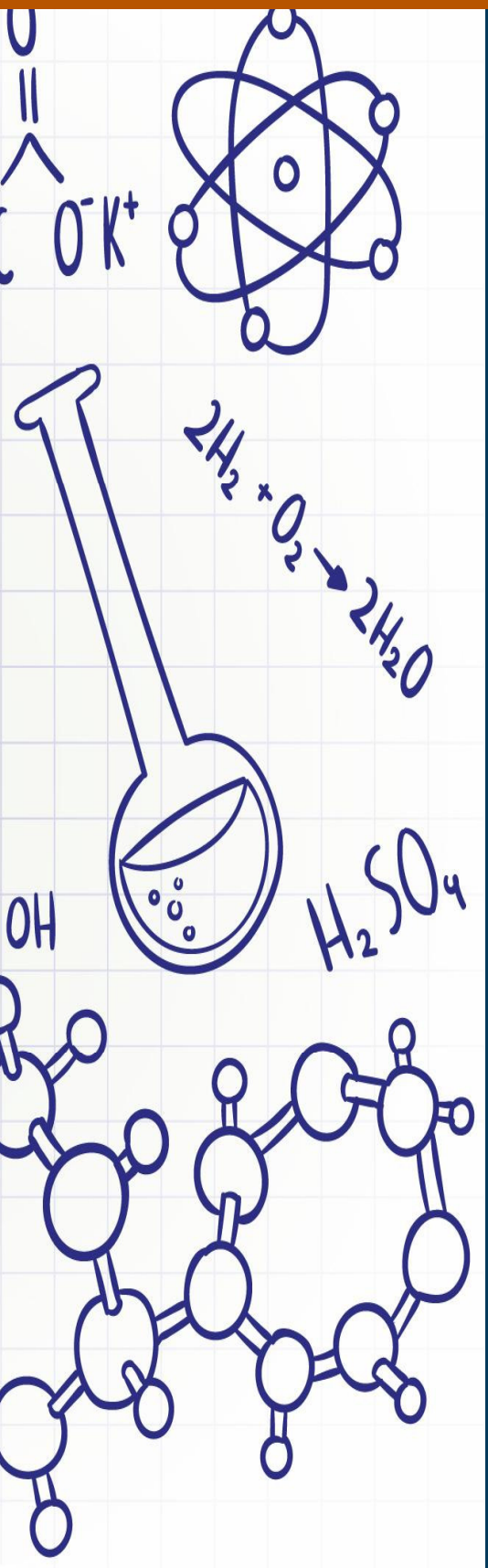

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Hydrophobicity in catalysts for wet peroxide oxidation

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Organic pollutants, such as phenol and its derivatives, are commonly present in wastewaters from several industries. These compounds are difficult to remove by conventional biological processes, mainly when present at high concentrations (1-10 g L^{-1})[1]. Catalytic wet peroxide oxidation (CWPO) is regarded as a potential solution for the treatment of aqueous effluents containing this type of recalcitrant, toxic and non-biodegradable compounds. Recently, carbon-based catalysts have been found to be promising for this process, showing high activity and stability, and being capable to ensure an efficient H_2O_2 consumption[2]. In this work, three samples of carbon nanotubes, neat (hydrophobic surface), fully N-doped (hydrophilic surface) and partially N-doped, have been synthesized by chemical vapor deposition[3] and tested in the CWPO of highly concentrated 4-nitrophenol solutions (4-NP 5 g L^{-1}) at relatively mild operating conditions (atmospheric pressure, T = 50 ºC, pH = 3), using a catalyst load of 2.5 g L^{-1} and a H_2O_2 concentration of 17.8 g L^{-1}. Due to their electron-donating properties, the basic N-containing groups contribute to the H_2O_2 decomposition. Beyond, the results also demonstrate that the catalysts hydrophobicity/hydrophilicity is a determinant property in CWPO (Figure 1). The controlled direct formation of reactive radicals ($HO^{\bullet}$ and $HOO^{\bullet}$) at the more hydrophobic surfaces competes with the accumulation of non-reactive species (O_2 and H_2O), increasing significantly the activity of the catalysts for the pollutant removal.

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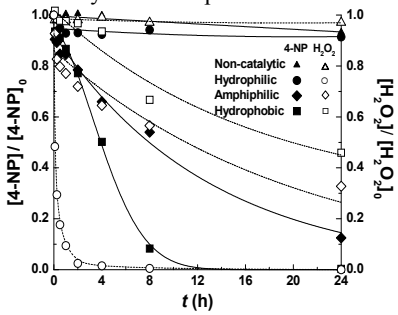

Figure 1. Evolution of the concentration of 4-NP and H_2O_2 during the CWPO experiments.

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