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CATALYTIC WET PEROXIDE OXIDATION OF PARACETAMOL USING CARBON NANOTUBES SYNTHESIZED FROM LOW-DENSITY POLYETHYLENE AS MODEL PLASTIC WASTE

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One of the ongoing concerns related with wastewater treatment is the presence of micropollutants on water bodies, since they accumulate due to its recalcitrant behavior and its constant introduction in the system [1]. Catalytic Wet Peroxide Oxidation (CWPO) is a wastewater treatment technology based on the generation of powerful oxidants (hydroxyl radicals) from the decomposition of H_2O_2, providing that suitable solid catalysts are used, with promising results being reported in the removal of pharmaceuticals [2]. On the other hand, plastic waste is an actual concern in waste management, and alternatives to its post-use should be sought [3]. This study aims at the CWPO of paracetamol (PCM) as model micropollutant, using as catalysts carbon nanotubes (CNTs) synthesized from low-density polyethylene, as representative polymer found in municipal plastic solid waste streams. The CNTs were synthesized by chemical vapor deposition at 800 ºC, considering three catalyst based on Ni, Fe and Al prepared by co-precipitation and wet impregnation methods. The synthesized CNTs were further tested on the CWPO of PCM (100 mg L^{-1} of PCM, pH_0 3.5, 474 mg L^{-1} H_2O_2, $C_{catalyst}$ = 2.5 g L^{-1} and 80 °C). All catalysts tested led to the complete conversion of both PCM and H_2O_2 after 24 h of reaction time (**Figure 1(a,b)**), with a contribution of 23-42% of adsorption according to pure adsorption tests performed at the same operating conditions (**Figure 1(d)**). The CNT synthesized on the catalyst prepared by the impregnation method shows a lower contribution of adsorption and led to a mineralization of 70% after 24 h of reaction time, with the highest efficiency of H_2O_2 consumption (determined as TOC conversion divided by H_2O_2 conversion).

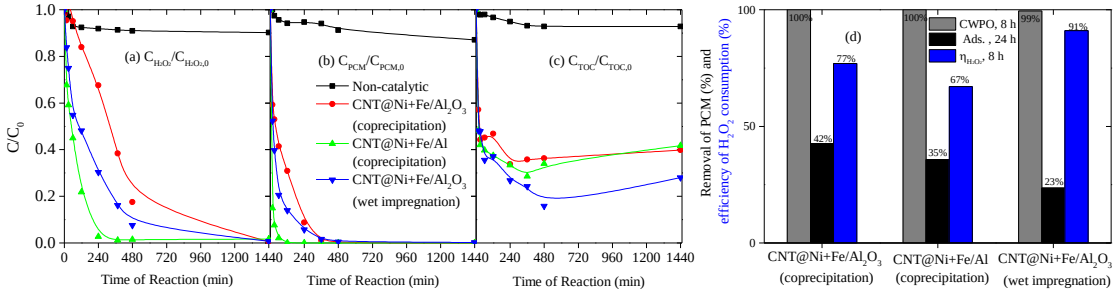

Figure 1. Concentration upon time of (a) H_2O_2, (b) PCM and (c) TOC and (d) Removal of PCM by CWPO, adsorption and efficiency of H_2O_2 consumption

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