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Treatment of leachate waters by wet peroxide oxidation with a compost-based catalyst: effect of pH

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A compost-based catalyst was synthesized by hydrothermal carbonization following the procedure described elsewhere[1] (3 g of compost in 30 mL of water, 230 °C for 2 h). The material was assessed in the catalytic wet peroxide oxidation (CWPO) of a leachate water, generated during an anaerobic digestion of municipal solid waste. The leachate water is characterized by a high pollutant load (chemical oxygen demand, COD, of 60 g L^{-1} and total organic carbon, TOC, of 27 g L^{-1}). The CWPO runs were conducted at initial pH (pH_0) of 3 and 6, and at the natural pH of the effluent (7.2), $C_{catalyst}$ = 1.8 g L^{-1}, 80 °C, and the stoichiometric concentration of H_2O_2 needed to mineralize the organic content (based on COD). Fig. 1 shows the results obtained along the reaction. An acidic pH (pH_0 = 3) resulted in a more controlled, but also incomplete, consumption of H_2O_2, leading to a low conversion of COD and TOC (20 and 10%, respectively). Contrarily, the natural pH led to a very fast and uncontrolled consumption of the oxidant source, resulting in 100% decomposition of H_2O_2 in less than 2 h of reaction, but failing to remove COD or TOC (negligible removal, ca. 0%), ascribed to parasitic reactions occurring by the inefficient consumption of H_2O_2. At pH_0 = 6, an intermediate behavior was observed: complete decomposition of H_2O_2 was possible, at a more controlled rate compared to the natural pH. The result was an increment in COD (41%) and TOC removals (19%), almost two times than that observed at the pH_0 3.

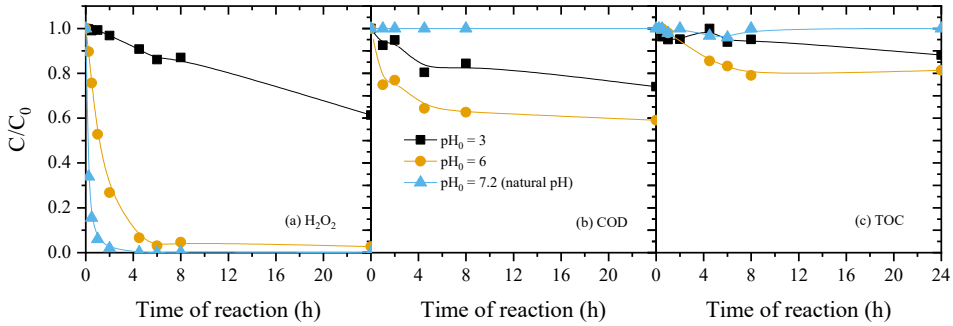

Figure 1. Effect of pH on (a) H_2O_2 concentration, (b) COD removal, and (c) TOC removal.

References

[1] Roman, F. F.; Diaz de Tuesta, J. L.; Praça, P.; Silva, A. M. T.; Faria, J. L.; Gomes, H. T.; *J. Environ. Chem. Eng.,* **2021**, 9, 104888.

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