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OPTIMIZATION OF MAGNETIC GRAPHITIC NANOCOMPOSITES FOR THE CATALYTIC WET PEROXIDE OXIDATION OF LIQUID EFFLUENTS FROM A MECHANICAL BIOLOGICAL TREATMENT PLANT FOR MUNICIPAL SOLID WASTE

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Mechanical biological treatment (MBT) plants are an established option to limit the environmental impact of direct landfill disposal, while benefiting from resources and energy recovery. However, a significant amount of liquid stream with high pollutant load is usually generetared in MBT plants. In a previous work, a hybrid magnetic graphitic nanocomposite (MGNC) catalyst – composed by a magnetite core and a graphitic shell – revealed a high performance when applied in catalytic wet peroxide oxidation (CWPO) [1]. Seeking for MGNC catalyst optimization, nickel and cobalt ferrites were prepared in the present work and encapsulated within a carbon shell in addition to magnetite. The material composed by the cobalt ferrite core ($CoFe_2O_4$/MGNC) revealed a superior performance in CWPO, achieving a remarkable abatement of the liquid effluent collected from a MBT plant located in Portugal [9206 mg L^{-1} chemical oxygen demand (COD); 1933 mg L^{-1} biochemical oxygen demand; 2046 mg L^{-1} total organic carbon (TOC); 14350 mg L^{-1} bicarbonates; 3664 mg L^{-1} chlorides; 14.7 x 10^4 CFU mL^{-1} heterotrophic bacteria]. The results obtained in a series of CWPO runs performed at near neutral pH with consecutive reuse of $CoFe_2O_4$/MGNC are given in Figure 1. For that purpose, a magnetic separation system was applied for catalyst recovery after each cycle, the treated water being replaced by a fresh effluent sample. In addition, desinfection of the effluent was also achieved, the treated water revealing no toxicity against selected bacteria.

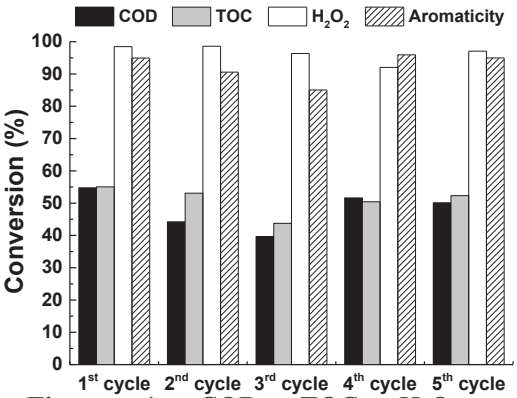

Figure 1. COD, TOC, H_2O_2 and aromaticity conversions obtained after 24 h in five CWPO runs performed with consecutive reuse of the $CoFe_2O_4$/MGNC catalyst, with pH 6 and T = 80 °C

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References

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