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Electrocatalysts based on carbon nanotubes: application to wastewater treatments

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The increasing awareness of water pollution with organic compounds, such as dyes, and their long term effects has encouraged intensive efforts towards pollution abatement. Electrochemical oxidation may constitute an alternative route to the existing methods. Electricity may substitute some toxic redox agents and may permit the oxidation of pollutants in mild conditions i.e. ambient temperature and atmospheric pressure. In recent years there has been increasing interest in multiwalled carbon nanotubes (CNTs) as heterogeneous catalyst supports [1] owing to their high surface area and high electrical conductivity. These peculiar characteristics qualify CNTs as adequate electrocatalysts or as catalyst support materials for the oxidative degradation of organic pollutants in wastewater [2]. In this context the electrochemical oxidation of some refractory compounds like oxalic and oxamic acids, some organic dyes and pesticides was investigated on mono and bi-metallic catalysts supported on multiwalled carbon nanotubes (CNT) aiming at the total transformation of these compounds into carbon dioxide and water. The electrochemical performance of metallic electrocatalysts for nitrate reduction in wastewater was also evaluated having in mind a paired electrolytic process. The electroreactivity of the pollutants on selected electrocatalysts was studied by cyclic voltammetry. Kinetic parameters of the reactions were also determined using this last technique. Exhaustive electrolyses were carried out to determine the mineralization rates and the product distribution. Finally the use of CNT and metal modified CNT as support material for anodic biofilm in microbial fuel cells was studied.

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