



Eletrodos de nanotubos de TiO₂: uma ferramenta poderosa no tratamento ambiental, eletroanálise, desinfecção de água, produção de hidrogênio e conversão de CO₂

TiO₂ nanotube electrodes: a powerful tool in environmental treatment, electroanalysis, water disinfection, hydrogen production and CO₂ conversion

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Abstract: The great versatility of TiO₂ as semiconductor materials and the possibility of electrons, holes, hydroxyl radicals and/or superoxide radical's generation has increased their applicability as catalyst. Electrodes based on self-organized nanotubes of Ti/TiO₂ is one of the most studied compounds in materials science and easy to grow by electrochemical methods. Special attention will be focused on the applications of TiO₂ and the modification of its surface at nanoscale architectures, with great improvement of the electrocatalyst properties useful for degradation of organic pollutants, reduction of inorganic contaminants, microorganism inactivation, development of electrochemical sensors, CO₂ reduction and hydrogen production with great success. In order to improve the power of the technique we have developed several types of semiconductor nanostructured based on TiO₂ with and without decoration with nanoparticles of Pt, Ag, B, Sb₂S₃, complex of copper aspirinate, MOF and composites of TiO₂/WO₃ and Si/TiO₂ decorated with Pt or Au and combined processes. They were applied successful in photoelectrocatalytic reactors with great enhance in the efficiency of: i) micropollutant contaminants treatments and almost complete removal of its residues and toxicological/mutagenic properties in surface water and water treatment plant; ii) removal of inorganic pollutants such as bromate, nitrate and nitrite iii) inactivation of mycobacteria and fungus; iv) conversion of CO₂ in alcohols and v) hydrogen production, with the aim to improve the cost/benefit involved in water treatment. Although Ti/TiO₂ nanotubes electrodes are semiconductors of n-type they can be self-doped by Ti³⁺ generated by using a simple cathodic polarization given a new electroanalytical approach in the development of electrochemical sensors with high sensitivity and selectivity for some amines and diuretics used in forensic analysis.

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