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**SYNTHESIS AND PHOTOCATALYTIC ACTIVITY OF CE-DOPED TiO2 AND TiO2 NANOTUBES**

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One-dimensional nanostructures have been intensively studied, from the point of view of their synthesis and mechanisms of formation, as well as their applications in photonics, solar energy conversion, environmental and photocatalysis, since their properties due high surface area, electrical conductivity and light dispersion effects. Titanium dioxide (TiO2) nanoparticles have been demonstrated to be an effective multifunctional material especially when the particle size is less than 50 nm exhibit photoinduced activities that originate from the semiconductor band gap. TiO2 is semiconductor more used in photocatalysis, for this reason various properties have been thoroughly investigated in order to show that the photocatalytic activity and TiO2 reaction mechanism are influenced by structure, defects and impurities, surface morphology. and interfaces in addition to the concentration of dopants, such as rare-earth elements. Cerium ions, for example, vary between Ce4+ and Ce3 + oxidation state making the cerium oxide appear as CeO2 and Ce2O3 under oxidation and reduction conditions. These different electronic structures of Ce3+ (4f15d0) and Ce4+ (4f05d0) provide different catalytic and optical properties at the TiO2. In this work, samples of Ce-doped TiO2 and TiO2 were synthesized by alkali route, and its photocatalytic activity analyzed in order to create a relationship between the response obtained and the structure and morphology of each sample. Alkali route consists in submitting TiO2 (anatase) powder directly in medium of the NaOH (10M) and maintained at 120°C/20 hours by a glycerin bath with subsequent washed with water and HCl (0.1M) until reaching the desired pH. The synthesized samples were then studied by X-ray diffraction (XRD), transmission electron microscopy (TEM), and X-ray photoelectron spectroscopy (XPS). The photocatalytic decomposition of rhodamine B (Rh.B) it was performed under UV irradiation and visible light in air. For the obtained samples with pH 7, XRD measurements showed the coexistence of TiO2 and sodium titanate phase. By decreasing the pH during acid washing the sodium content was eliminated leaving only the main phase. This behavior was observed for samples containing Cerium concentrations up to 0.2%. The obtained nanotubes presented multiple walls, having dimensions of 5 nm of diameter and about 200 nm of length. Energy dispersive X-ray spectroscopy analyzes revealed that nanotubes are mainly composed of titanium and oxygen, with small amounts of sodium when pH is 7 and sodium no was observed for the sample obtained at pH 4. It shows that synthesis conditions are very important in order to obtain single-phase structures. In addition, TiO2 nanotubes showed good photocatalytic activity with degradation around 100 minutes.