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ÁREA: Síntese e caracterização de catalisadores e adsorventes

Synthesis and characterization of the SBA-16/TiO_2 photocatalyst obtained by *in situ* anchoring method

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Resumo-Abstract

Titanium oxide (TiO_2) is a semiconductor that has some advantages, such as good photosensitivity, low toxicity and chemical stability, however, it has limitations regarding the particle size and recovery rate, which makes its application unfeasible on a large scale. This limitation can be overcome by inserting the oxide into a support. The SBA-16 molecular sieve is a mesoporous material that features thermal stability, narrow pore distribution, large surface area and ordered pores that enable easy access of target molecules on the inner surface of the material, properties that give it the possibility of catalytic support. The present study aimed to obtain the mesoporous material SBA-16 incorporated with TiO_2 by the method called *in situ* anchoring (ISA). The synthesis of SBA-16 modified with TiO_2 was performed in three different silicon/titanium ratios: 25, 50 and 75, by the hydrothermal method, using the organic F_{127} and tetraethosilane silicon source (TEOS). For the anchoring of TiO_2 nanocrystals, the synthesis was modified by inserting different concentrations of the colloidal solution of titanium isopropoxide before TEOS. The materials were calcined at 550 ºC, with a heating ramp of 1 ºC/min, remaining for 6 h and characterized by XRD, N_2 adsorption and desorption, Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-OES) and thermogravimetric analysis (TGA). The low angle X-ray diffraction showed reflections in 2θ attributed to the diffraction plane (110), characteristic peak of SBA-16. In addition, the increased concentration of titanium did not damage the structure of the supports. In high angle difratrograms an intense peak is seen referring to the amorphous phase of silica and secondary peaks of lower intensity indicate the anatase phase of TiO_2. In the adsorption and desorption of N_2, the materials presented isotherms type IV with hysteresis of type H2 characteristic of materials with uniform mesoporos similar to cages interconnected by relatively narrow openings, confirming the incorporation of TiO_2 in the support. The specific area increased with the incorporation in the ratios of 25 and 50 indicating that TiO_2 is not on the outer surface of the support. The total pore volume decreased with the presence of TiO_2 due to the concentration of titania in the inner part of SBA-16. The volume of micropores increased with the insertion of TiO_2 indicating that the pores were not filled by nanocrystals. The ICP-OES determined values close to theoretical, being: ratio Si/Ti 25 (17.76), Si/Ti 50 (40.40) and Si/Ti 75 (52.78). In thermogravimetric analysis it is possible to observe 3 events for all samples, referring to the output of physisorbed water and chemisorbed. The synthesis of mesoporous material SBA-16 modified with TiO_2 by the *in situ* anchoring method (ISA) was proven by XRD and adsorption and desorption of N_2, ICP-OES and thermogravimetric analysis evidenced thermal stability. The materials obtained may be promising in photocatalysis reactions, due to the greater dispersion of TiO_2 nanoparticles as well as their recovery and reuse can be feasible because they are anchored in SBA-16.

Keywords: Anatase; Titanium dioxide, Mesoporous material, Colloidal solution, Advanced oxidative processes.

Referências

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