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Gramado-RS

25 to 29 | september 2011

16 symposia with oral, poster and invited lecture presentations

Plenary lectures

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Celebration of 10 years of Brazilian MRS

Conference Details and Registration

All attendees are encouraged to visit the conference website http://www.sbpmat.org.br/x-meeting for further and updated information such as registration, submission of abstracts, important links for traveling (visas, travel agencies) and hotel reservation.

Symposia

A) Magnetic and Superconducting Materials

B) Biodegradable Polymer Materials

C) Electronic Materials

D) Surface Engineering: Fabrication, Characterization, Properties and Applications of Protective Coatings and Modified Surfaces

E) Materials with Negative Properties

F) Nanostructured Functional Materials for Advanced Energy and Environmental Applications

G) Molecular Modeling Materials Science

H) Structure-property Relationship of Advanced Metallic Materials

I) Sol-gel Route to Prepare New Inorganic, Hybrid and Multifunctional Materials

J) Solidification of Metals and Alloys

K) Supramomolecular Organic Materials for Electronic, Photonics and Nanotechnology

L) Structure-Property Relationship of Ceramic Materials: Theoretical and Experimental Aspects

M) Advances and Applications of Electron Microscopy

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10 years of excellence in the congregation of science and research in materials technology in Brazil

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Important Dates

April, 5th - Registrations open
May, 30th - Submissions deadline
June, 13th - Acceptance

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Hydrothermal synthesis of Ti oxides - SnO_2 in nanometric sizes applied to the photodegradation of rhodamine B.

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This paper describes the hydrothermal synthesis of the Ti oxides nanostructures and Ti oxide – SnO_2 heterostructures in alkaline conditions. For these syntheses, 0.200 g of the precursor commercial TiO_2 (or commercials TiO_2 and $SnCl_2$, for the syntheses of the heterostructures) were dispersed into 100 mL of KOH at 10^{-4}, 10^{-2}, 1 e 5 mol.L^{-1}. For tentative of syntheses of the heterostructures it was used a molar ratio Ti/Sn (9/1), according with a previous study [1]. These suspensions were then transferred into a stainless steel autoclave with a Teflon liner of 100 mL capacity and heated at 200 °C for 2 h. The obtained powders were characterized by X-ray diffraction (XRD); surface area (S. A.); energy-dispersive X-ray (EDX); X-ray Absorption Near Edge Structure (*XANES*); field emission gun scanning electron microscopy (FEGSEM) and high-resolution transmission electron microscopy (HRTEM). The liquid supernatants from syntheses by using of both TiO_2 and $SnCl_2$ were characterized by atomic absorption to evaluate the presence of Sn. Also, Rhodamine-B (Rho-B) dye was used as a probe for the photocatalytic performance of the synthesized materials.

In the concentrations of KOH ranging from 10^{-4} to 1 mol.L^{-1} were obtained nanoparticles of TiO_2 anatase with middle values of surface areas. In the syntheses by using both precursors the TiO_2 and $SnCl_2$ it was also identified SnO_2 cassiterite for the materials obtained in the concentrations of 10^{-4} and 10^{-2} mol.L^{-1}. In the materials obtained at 1 and 5 mol.L^{-1} any Sn phases were not identified by XRD. On the other hand, in these latter concentrations, high amount of Sn were observed by the atomic absorption analysis, indicating that the Sn remained dissolved (as Sn^{+2} or Sn^{4+}) during the synthetic process in KOH at 1 and 5 mol.L^{-1}. Then, the hydrothermal synthesis of the heterostructures of Ti oxides-SnO_2 was not possible in these concentrations. As evaluating the materials obtained at KOH 5 mol.L^{-1} (in both conditions by using or not of $SnCl_2$ during the syntheses) were identified potassium titanate nanotubes with high surface area of about 270 $m^2.g^{-1}$. The EDX analysis of all powders also indicates the presence of Sn only for materials obtained at 10^{-4} and 10^{-2} mol.L^{-1}. Also, the EDX indicates molar ratios of K/Ti in the powders obtained at 5 mol.L^{-1} higher than other materials. From XANES analysis, it was not observed changes in the absorption band of the Ti in the heterostructures TiO_2-SnO_2 (obtained at 10^{-4} or 10^{-2} mol.L^{-1}) indicating that these materials were not doped and so the SnO_2 phase probably are on the surface of the TiO_2 nanoparticles. The photodegradation tests demonstrated that TiO_2 anatase phases were more active than titanate phases for photodegradation of the Rho-B. Also, the materials with both associated phases TiO_2 and SnO_2 were more active than their respective materials without SnO_2, which were obtained in the same KOH concentrations.

Keywords: Hydrothermal synthesis, semiconductors, heterostructures, photocatalysis.

References:

[1] J. Lin, J. C. Yu, D. Loy and S. K. Lamy, J. Catal. **183**, 368 (1999).

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