Laser-Induced Approach to Nanoscopic Titanium Oxycarbides

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Laser-induced Approach to Nanoscopic Titanium Oxycarbides ***PA71***

IR laser-induced reactive ablation of frozen titanium ethoxide target was studied. The major effort is to discern among Ti_xO_2-x, Ti_xO_1-x and TiC_xO_y species. The method involves the laser ablation of titanium ethoxide at -140 °C in the gaseous methane (2^{-15} Pa). This process leads to reactions of the ablative species with hydrocarbon in the gaseous phase.During the ablation of the frozen target excited species interact with methane molecules. The carbidation leads to the formation of a smooth thin film. The thickness of prepared film and its composition depend on the pressure of gaseous methane and number of IR pulses. This reactive IR ablation proceeds as a carbidation process affording nanostructured films with good adhesion to various substrates (glass, metals, KBr) and hydrophility depending on the carbon content in prepared film. Particles are also stabilized by carbon layer preventing their surface oxidation in the atmosphere. The described results are important in the general context for the synthesis of reactive particles in the gas phase.The final products are characterized by spectroscopic, microscopic and diffraction techniques: SEM/EDX, TEM, electron diffraction, FTIR, Raman spectroscopy, XPS and XRD.

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Nanosize $BaTiO_3$ Formation from Barium Titanyl Oxalate (BTO) Precursor under Hydrothermal Conditions ***PA72***

The formation of $BaTiO_3$ via the decomposition of Ba-Ti oxalate precursors by instant hydrothermal method (invented byRichard Riman et al., US 20110044876-A1) was studied. The tetramethylammonium hydroxide (TMAH) was used as a basic reagent. All decomposition studies were conducted at RT and 100 oC under the 1 atm of pressure. The effect of decomposition conditions (reactant concentration of oxalate and basic reagent, temperature, the type of solvent and surfactant) on the formation of $BaTiO_3$ was examined.

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Comparative Study of Titanium Dioxide's Rheological Properties ***PA73***

Titanium dioxide is widely used material. Although it was described some 210 years ago, it still represents a topic of intense scientific research and also many publications were written. The rapidly growing interest in this material has been recently initiated by its special utilization. Titanium dioxide is used primarily as a component of paints and plastics, paper, leather, the treatment of ceramics, but also as an additive in food or as an ingredient in cosmetics and pharmaceutics. The aim of the presented paper is characterization of TiO_2 samples which show different rheological properties due to different volume of fine particles. Experimental work was performed by the Freeman Technology FT4 Powder Rheometer and CPS DC24000 Disk Centrifuge. The devices allow obtaining a considerable amount of information about powder properties and behaviour like a bulk density, granulometry, friction, compressibility, aeration, permeability or mechanical interlocking. All of these parameters give information about behaviour of bulk solids in wide scale of industrial applications because many flow failures can happen. (e.g. arches, chimneys, etc.). Two commercial samples which differed in size fine particles fraction were used. The results of laboratory experiments show that difference in fine fraction has an influence on the rheological properties of the samples and their further processing. The changes were observed mainly in compression factors and permeability powders.

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Synthesis and Characterization of Tin Titanate Nanotubes: As Precursors for Nanoparticulate Sn-doped TiO_2 Anodes with Synergistically Improved Electrochemical Performance ***PA74***

The synthesis of tin-titanate nanotubes (Sn-titanate) by reacting hydrogen titanate (H-titanate) with a tin salt through ion adsorption-incorporation is reported. The interactions between tin(II) ions and H-titanate are thoroughly investigated. Tin ions can be easily adsorbed by H-titanate, owing to its large surface area and lattice spacing, and the negatively charged layered structures. With Sn-titanate nanotubes as precursors, Sn-doped TiO_2 nanoparticles are prepared by annealing and are investigated as anode materials in lithium-ion batteries, which show much enhanced capacity and rate capability.