

Nanostructured surfaces

Tuning the structure of 2D and 3D sol-gel titania nano hybrids by careful anion doping

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The tuning of surface and structure is beneficial to many TiO₂-based devices, as it facilitates interaction between the devices and the interacting media, which mainly occurs on the surface or at the interface and strongly depends on the surface area of the material. The structure and surface properties of TiO₂ is largely determined by its electronic structure are closely related to its chemical composition and atomic arrangement. The chemical composition of TiO₂ can be altered by doping when the cation or the anion component can be replaced in order to alter the material's optical properties. Known difficulties to replace ones with other due to differences in charge states and ionic radii can be facilitated on nanolevel due to the higher tolerance of the structural distortion than of bulk materials induced by the inherent lattice distortion in nanomaterials. We studied factors strongly influence on the characteristics of 3D and 2D nanostructures which would help to tune the quality of mesoscale surface and developed the self-assembled design based on the sol-gel method to fabricate of careful anion doped hybrid nanocomposite using network-forming titania.

It was found that the anion doped TiO₂ 3D nanostructures successfully promote photocatalytic reaction due to the existence of a threshold of dopant concentration, calcination temperature, OH surface density, morphology and nature of dopant. Moreover, the careful modification of anion doped TiO₂ material allow significantly enhanced the hydrophilicity of surface and as a consequence conductivity of Nafion membrane of the middle-temperature fuel cell (up to 200°C). Preliminary results show that careful dye doped 2D titania nano hybrids are characterized by enhanced luminescence[1,2] and can demonstrate nonlinear optical response under excitation of optical pulses of nanosecond duration. For these films, we also observed lasing with reducing the threshold pump intensity that is evidence of formation the waveguide amplifier in the titania film.

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2. G. Telbiz, E. Leonenko, M. Dvoynenko Optical properties of Rh6G molecules ordering in the silica- and titanium dioxide mesoscopic sol-gel films//*Mol. Crystals and Liquid Crystals*.- 嶠嶠嶠嶠. 嶠嶠嶠嶠.- P.嶠嶠-嶠嶠