

One-Step Synthesis of Titanium Dioxide Porous Microspheres by Picosecond Pulsed Laser Welding

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Abstract : Porous spheres have been widely used in many fields due to their attractive features. In this work, an approach for fabricating porous spheres of nanoparticles was presented, in which the nanoparticles were welded together to form microspheres by simply irradiating the nanoparticles in liquid medium by a picosecond laser. As an example, anatase titanium dioxide was chosen as a typical material on account of its metastability. The structure and morphologies of the products were characterised by X-ray diffraction (XRD), scanning electron microscope (SEM), Raman, and high-resolution transmission electron microscopy (HRTEM), respectively. The results showed that, anatase titanium dioxide microspheres (2-10 μm) with macroporous (10-100 nm) were prepared from nano-anatase titanium dioxide nanoparticles (10-100 nm). The formation process of polycrystalline anatase titanium dioxide microspheres was investigated with different liquid mediums and the input laser fluences. Thus, this facile laser irradiation approach might provide a way for the fabrication of porous microspheres without phase-transition.

Keywords : titanium dioxide, porous microspheres, picosecond laser, nano-welding

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