

عنوان مقاله:

Chemical synthesis of Lead Iodide nanoparticles for photovoltaic and optoelectronic device applications

محل انتشار:

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خلاصه مقاله:

In the present study, highly recommended lead iodide (PbI<sub>2</sub>) nanoparticles and thin films based on PbI<sub>2</sub> nanoparticles have been prepared for optoelectronics and solar cell applications. PbI<sub>2</sub> is an anisotropic p-type semiconductor with a band gap of ۲.۵۷ eV at room temperature. PbI<sub>2</sub> material has large potential applications in optical detector, digital X-ray imaging, gamma ray detector, etc. PbI<sub>2</sub> layered semiconductor nanoparticles were stabilized using thioglycerol and investigated by Ultraviolet-Visible (UV-Vis) absorption spectroscopy, X-ray Diffraction (XRD), X-ray Photoelectron Spectroscopy (XPS), transmission electron microscopy (TEM) and photoluminescence (PL) spectroscopy. The chemical bath deposition (CBD) method was used to deposit PbI<sub>2</sub> thin films on fluorine-doped tin oxide (FTO) glass substrates. These films were characterized by scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), mapping and atomic force microscopy (AFM). Thicknesses of PbI<sub>2</sub> thin films were estimated using a laser profilometer. The blue shift was observed in UV-Vis absorption and PL spectra of PbI<sub>2</sub> nanoparticles. TEM was used to obtain quantitative information on the PbI<sub>2</sub> particle size distribution. Due to the low solubility of PbI<sub>2</sub> in acetonitrile, approximately ۲۰-۳۰ nm sized circular particles are obtained. The variation of ۱۸ Å was observed in the lateral dimensions of PbI<sub>2</sub> nanoparticles. Pb۴fXPS core level appeared at ۱۳۸.۵ eV corresponding to PbI<sub>2</sub>. There is no report published wherein the PbI<sub>2</sub> nanoparticles and the PbI<sub>2</sub> thin films were prepared by the aqueous chemical method and the CBD method respectively. In this study, the characterization results of PbI<sub>2</sub> nanoparticles and PbI<sub>2</sub> thin films were better than many other materials

کلمات کلیدی:

Synthesis, Characterization, nanoparticles, PbI<sub>2</sub> thin films, Chemical bath deposition method

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