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Looking for quantum size effects in Zr-Pb-O2 one dimensional nanorods

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In the present work, we synthesized ZrO_2:PbO_2 nanorods samples were prepared by solvothermal process and the physiochemical properties of ZrO_2:PbO_2 nanoparticles were determined by using X-ray diffraction (XRD), ultraviolet–visible spectroscopy (UV–vis), Transmission electron microscope (TEM), Energy dispersive X-ray spectrometer (EDX) and X-ray photoelectron spectroscopy (XPS). The photocatalytic activity was evaluated by the degradation of methylene blue (MB) dye under UV and visible light irradiation. The solvothermal made ZrO_2 treated PbO_2 nanorods showed the highest photocatalytic activity under both UV and visible light irradiation. The addition of the ZrO_2:PbO_2 resulted in the formation of partial monolayer of ZrO_2 doped ZrO_2:PbO_2 nanorods and an increase of the anatase phase stability. The XPS results reveal that the calcinated ambiance affected the distribution concentration of surface and interface species in ZrO_2 and Zr-doped PbO_2, such as surface oxygen and Pb3þ sites, thus improving photo catalytic activity.

Biography

Kaviyarasu obtained his Master of Science (M.Sc.) & Master of Philosophy (M.Phil.) degree in Physics from Loyola College (Autonomous), Chennai, affiliated to the University of Madras, India. He has carried out research on Semiconductor Metal Oxide Nanocrystals & Synthesis and characterization of Hybrid Nanomaterials for energy applications. During the course of his research work, he has published 33 papers in International/National Journals and presented 35 papers in National and International conferences. Currently his a Postdoctoral researcher at UNESCO-UNISA Africa Chair in Nanosciences/Nanotechnology Laboratories, College of Graduate Studies, University of South Africa (UNISA), South Africa. My research is directed primarily toward developing and applying modern material design for the understanding and prediction of Physico - Chemical processes ranging from the molecular to the nanoscale to full-size engineering applications, using a multidisplinary approach that Physics, Chemistry, and Materials science. Work is closely coupled with synthesis and characterization of Hybrid Nanomaterials at the Center for Nanoscience and Nanotechnology, where scientific focus is on using theory and multiscale simulations and modeling for providing interpretive and predictive frameworks for virtual design and understanding of novel nanoscale materials with specific and/or emergent properties. This vision is possible through a multi-pronged, holistic, and tight integration with Materials Research Division (MRD) distinctive capabilities in precision experimental synthesis and characterization alongside leadership class computing. Understanding how atomic scale structure, confinement, and quantum mechanical effects impact electronic processes within these nanostructures and across interfaces to enable the design and synthesis of materials with prescribed functional (physio-chemical) properties. Very thin sheets of a material can exhibit greatly enhanced properties such as increased electrical conductivity as compared with the bulk and are well suited for applications in new electronic devices. Our goal is to understand how to design and control the nanoscale organization of macromolecular nanomaterials and their nanocomposites in order to achieve improved structure, properties, and functionality. The iThemba Laboratory for Accelerator-Based Sciences (iThemba LABS) where he studies materials for energy applications. His research interests include bulk and nanoscaled materials for solid-state-physics, and multifunctional metal oxide nanomaterial.

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