



3rd International Nanotechnology Conference & Expo

May 7-9, 2018 Rome, Italy

Investigation of ZnS based Core-Shell Particles: Synthesis Strategies, Properties and Potential Applications

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In recent years with the advancement of nanotechnology the scientific community is in constant search to come up with new material systems which exhibits improved and exceptional properties to be utilized in various potential applications. Core-Shell, also referred as core-shell particles happens to be one such special class of highly functional materials which has unfolded research opportunities in almost every area of science and engineering including medicine, chemistry, electronics, pharmacy, biotechnology etc. Various metals, dielectrics, semiconductors, biomolecules, dyes can be utilized for the preparation of core-shell materials. In addition, new synthesis and fabrication process emerging has made it possible to prepare these nanostructured materials in desired size, shape and morphology with customized properties liked increased surface area, high stability and improved optical, chemical, magnetic properties. Interesting application of core-shell material systems is found in photonic crystals, sensors, fluorescent biological labels, bar codes, catalysis etc. This talk will provide an overview of the development, versatile properties and application of Zinc Sulfide (ZnS) based core-shell particles. ZnS is a well-known direct band gap ($E_g=3.68\text{eV}$) II-VI semiconductor which is one of the widely used metal sulfides with many technological applications. Later some of the interesting work carried out by our research group on ZnS will be presented. Here monodispersed ZnS nanoparticles and their corresponding core-shell particles using different synthesis strategies will be discussed. These core-shell particles are those based on silica either as core or shell. The novel and interesting applications of ZnS based core-shell particles will also be highlighted.