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Electrochemical and biosynthesis of nano-photocatalytic materials and its applications in photovoltaic, anti-bacterial, anti-cancer and in preparation of polymer composites

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A facile technique for electrochemical synthesis of multi-functional metal oxide and metal sulfide nanocomposites like $\text{In}_2\text{O}_3/\text{ZnO}$, $\text{In}_2\text{O}_3/\text{SnO}/\text{ZnO}$, ZrS_2/ZnS , CdO/ZnS and bio-synthesis of MnO_2 is achieved. Under ambient conditions, these methods are capable of producing nanorods, nanoflakes and flower-like particles in a size range about 05-30 nm with a wide band gap of 3.15-5.8 eV. Characterization techniques like SEM-EDS, TEM, ICPMs, XRD, PALS, zeta potential reveals the hierarchical structure and functionality of these materials. The enhancing influence of these nanomaterials as photo-catalyst for the degradation of textile industrial effluents and decomposition of KMnO_4 for oxygen evolution as source of energy has been studied. Anti-bacterial activity is tested against bioluminescent bacteria via MIC which shows 50% efficiency at mere 250 μg of nanoparticle. A linear correlation is achieved for photo-degradation and inactivation of bacteria as both are ROS dependent phenomena. The nanomaterials synthesized are doped into different polymers to prepare polymeric films like PVA-CoO/ZnO, POE- CdO/ZnS-. Conductivity studies of these polymeric films using conductometer, photo-voltaic property is done at different % of doping which shows a steep increase in the conductivity upon doping. These nanoparticles can be potentially applied to the rapid, green and low-cost degradation of industrial printing and dyeing wastewater.

Biography

S Ananda has more than 30 years of teaching and research experience. Presently, he is a Chairman and Professor in Department of Chemistry, University of Mysore, India. He has published 150 research articles in reputed international journals in the area of Chemical Kinetics, Bio-physical Chemistry and Nano Chemistry. At present, he is working on "Synthesis of nano materials by solvothermal, hydrothermal, electrochemical and biological, sol-gel method". These materials are applicable in the field of Photocatalysis, Electrical, Optical and Biological studies. His group is actively involved in the synthesis of nanocomposites of doped zinc oxide, doped zinc sulfide and polymers nano composites. He has reviewed many international research papers. He worked as a Research Associate at Tokyo Institute of Technology, Japan. He has visited several countries like USA, China, France, Japan and Singapore for paper presentation in conferences. He is Principle Investigator and Co-investigator for many projects sponsored by UGC, DST-PURSE, UPE, CPEPA and IOE. He has guided 16 PhD candidates and four MPhil candidates.

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