

A review on ZnO nanostructured materials: energy, environmental and biological applications

J Theerthagiri; Sunitha Salla; R A Senthil; P Nithyadharseni; A Madankumar; Prabhakarn Arunachalam; T Maiyalagan and Hyun-Seok Kim

Abstract

Zinc oxide (ZnO) is an adaptable material that has distinctive properties, such as high-sensitivity, large specific area, non-toxicity, good compatibility and a high isoelectric point, which favours it to be considered with a few exceptions. It is the most desirable group of nanostructure as far as both structure and properties. The unique and tuneable properties of nanostructured ZnO shows excellent stability in chemically as well as thermally stable n-type semiconducting material with wide applications such as in luminescent material, supercapacitors, battery, solar cells, photocatalysis, biosensors, biomedical and biological applications in the form of bulk crystal, thin film and pellets. The nanosized materials exhibit higher dissolution rates as well as higher solubility when compared to the bulk materials. This review significantly focused on the current improvement in ZnO-based nanomaterials/composites/doped materials for the application in the field of energy storage and conversion devices and biological applications. Special deliberation has been paid on supercapacitors, Li-ion batteries, dye-sensitized solar cells, photocatalysis, biosensors, biomedical and biological applications. Finally, the benefits of ZnO-based materials for the utilizations in the field of energy and biological sciences are moreover consistently analysed.