

Physica B: Condensed Matter

Luminescent, magnetic and optical properties of ZnO-ZnS nanocomposites

Pule V.Raleaooa^{ab} AndreasRoodt^b Gugu G.Mhlongo^c David E.Motaung^c Robin E.Kroon^a
Odireleng M.Ntwaeaborwa^d

^a Department of Physics, University of the Free State, ZA 9300 Bloemfontein, South Africa

^b Department of Chemistry, University of the Free State, ZA 9300, South Africa

^c DST/CSIR Nanotechnology Innovation Center, National Center for Nano-Structured Materials, Council for Scientific and Industrial Research, P.O. Box 395, ZA 0001 Pretoria, South Africa

^d School of Physics, University of the Witwatersrand, Private Bag 3, Wits, ZA 2050, South Africa

Abstract

The structure, particle morphology, optical and magnetic properties of ZnO, ZnS and ZnO-ZnS nanoparticles prepared by the sol-gel method are reported. ZnO and ZnS were combined at room temperature by an ex situ synthetic route to prepare ZnO-ZnS nanocomposites. The nanocomposites exhibited particle morphology different from that of ZnO and ZnS nanoparticles. The ZnO and ZnS nanoparticles exhibited quantum confinement as inferred from the widening of their respective bandgap energies. The electron paramagnetic resonance data provided evidence for the existence of magnetic clusters near the surface, electron to nuclei interactions and defect states. The ZnO-ZnS nanocomposites exhibited tunable emission that was dependent on the ratio of ZnO to ZnS. These composites were evaluated for application in different types of light emitting devices.