

Synthesis of Vertically Aligned CdSeS Nanorods on NiO Coated ITO–ZnO Layered Superstructures for Electrically Pumped LED Applications

ABSTRACT

This dissertation describes the synthesis of CdSe and CdSeS nanorods (NRs) by ‘Hot Injection’ method and ‘Electrophoretic Deposition’ technique (EPD) on Silicon-wafer and ITO substrates. The surface morphology of as-deposited thin films and full LED structure were studied by TEM, SEM, XPS. The optical and electrical properties were characterized by VimbaView, Spectrasuite and LABView software simultaneously for Photoluminescence (PL) and Current-Voltage (I-V) measurement. CdSeS with Hexylphosphonic acid (HPA) surfactant delivered fine shaped NRs with aspect ratio 4.5, vertically aligned and high PL intensity with wavelength 662 nm (room temperature), 640 nm (low temperature). CdSeS NRs has been exploited for designing LED having structure ITO/NiO/CdSeS/ZnO. From Scanning TEM, different layers have been viewed and diode-like curve with good current conductivity by I-V testing and finally LED fabrication with CdSeS NRs gives excellent performance. Likewise, compared to Se-rich sample, Se-less CdSe brought out smooth surface of NRs alignment having aspect ratio 3 and higher intensity of emission light along with 641 nm wavelength which can be used for device fabrication in future.