

Synthesis and properties of aluminum doped ZnO nanostructures for device applications

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Al-doped ZnO nanorods (NR's) having Al concentration up to 10 mol% were grown by the hydrothermal method. XRD measurements showed that the Al substituted ZnO NR's maintained the hexagonal wurtzite structure for all levels of Al substitution. EDX measurements of the ZnO: Al NR's indicated that the Al substitution created additional Zn

vacancies in the wurtzite structure which are reflected in the enhanced photoluminescence emission in the visible light spectra between 450 to 550 nm of the more heavily doped ZnO: Al NR's. SEM images of the heavier doped ZnO: Al nanorods showed nano nodules being formed on the surface of the hexagonal shaped NR's. The saturation magnetization of the ZnO: Al NR's as measured by a SQUID magnetometer increased to 10.66×10^{-4} emu/g as more Al was substituted in. The hysteresis loops for the ZnO: Al NR's began to exhibit novel effects, such as horizontal shift (exchange bias field 0.0382 kOe for the 9 mol % NR) and butterfly shapes.

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