Anomalous Blue Shift in Emission Spectra of ZnO Nanorods with Sizes beyond Quantum Confinement Regime

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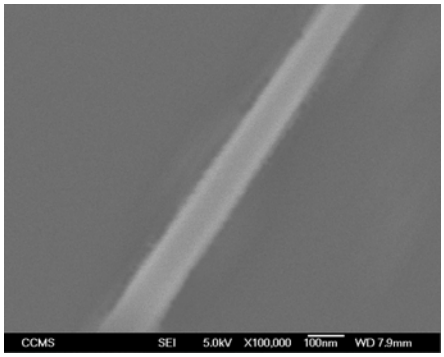
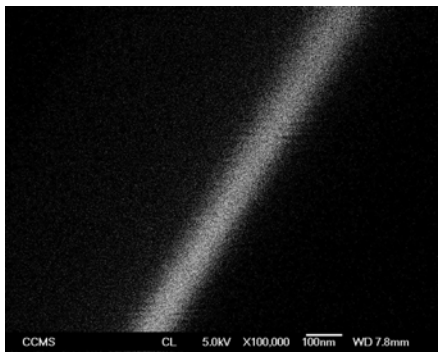
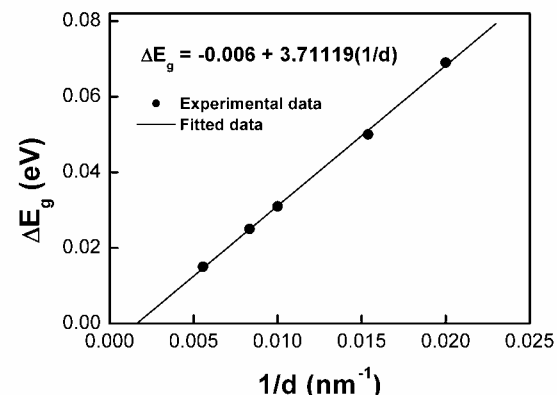
Cathodoluminescence (CL) spectroscopy has been employed to study the electronic and optical properties of well aligned ZnO nanorods with diameters ranging between 50 and 180 nm. Single-nanorod CL studies reveal that the emission peak moves toward higher energy as the diameter of the ZnO nanorod decreases, despite that their sizes are far beyond the quantum confinement regime. Blue-shift of several tens of meV in the CL peak of these nanorods has been observed. Moreover, this anomalous energy shift shows a linear relation with the inverse of the rod diameter. Possible existence of a surface resonance band is suggested and an empirical formula for this surface effect is proposed to explain the size dependence of the CL data.







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