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Electrically pumped near-ultraviolet lasing from ZnO Nanowire Based Heterojunctions[1] RICHARD MU, Fisk University, HAIYANG XU, YICHUN LIU, Northeast Normal University — ZnO with a band gap (3.37 eV) and an exciton binding energy (60 meV) is a promising material for ultraviolet (UV) light-emitting diodes (LEDs) and low-threshold lasing diodes. Much progress has been made recently to enhance band edge emission of ZnO nanowire (NW) structure through surface passivation and local surface plasmon enahncement with metal nanparticles. Efforts have been made to fabricate electrically pumped near-ultraviolet lasing devices with metal/insulator/semiconductor laser diode based on ZnO/MgO core/shell nanowires with and without metal nanoparticle presences. The nanowire diode shows higher emission intensity at relatively low operating current density compared with the planar device. The improved efficiency is attributed to enhanced exciton oscillator strength and superior carrier transport properties of single-crystalline ZnO nanowires, and effective surface passivation by MgO coating. Random laser action was confirmed by the calculation of quality factor and the real-time changes of lasing spectra. The results reveal that the MgO coating serves as electron blocking, hole supplying and surface passivation layer for the nanowire heterostructure. Other approaches will also be presented and discussed in the presentation.

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