

Abstract Submitted
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Oxygen annealing effects on optical properties of ZnO and TiO nanocluster thin film RYAN SOUZA, HUI CHE, YUFENG TIAN, YOU QIANG, University of Idaho, RENE RODRIGUEZ, LISA LAU, Idaho State University, PAUL TURNER, DMITRI TENNE, Boise State University — Thin films of zinc oxide (ZnO) and titanium oxides (TiO) were deposited on Si (100) substrate by third generation nanocluster source. Post deposition Oxygen Annealing (OA) effects were evaluated by X-Ray diffraction (XRD), Raman spectroscopy, and photoluminescence (PL). As deposited, diameter of ZnO nanoclusters ~ 24 nm and ZnO OA nanoclusters ~ 30 nm. As deposited TiO clusters ~ 10 nm in diameter, and TiO OA cluster ~ 20 nm. XRD shows increased crystal quality and improved ZnO c-axis crystal growth. XRD shows improved stoichiometric TiO₂ clusters and preferred anatase phase. Intensity of ZnO PL spectrum has temperature dependence from 10K to 300K. ZnO OA produces red-shifted PL peak, and there are no below-bandgap PL peaks. TiO has room temperature PL with UV peak ~ 388 nm and visible peak ~ 426 nm. ZnO OA nanoclusters show narrower, red shifted peak by ~ 0.07 eV compared to as deposited ZnO nanoclusters. This indicates increased average grain size and improved size homogeneity after annealing. This is confirmed by Raman spectra showing blue-shifted and narrower peak of the A₁ (LO) phonon peak in ZnO OA sample. DOE-EPSCoR (DE-FG02-04ER46142) DOE-BES (DE-FG02-07ER46386).

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