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Ultraviolet-Photoluminescence and Raman Properties of $Mg_xZn_{1-x}O$ Nanopowders[*1] JOHN MORRISON, XIANG-BAI CHEN, JESSE HUSO, HEATHER HOECK, JAMES MITCHELL, LEAH BERGMAN, University of Idaho, TSVETANKA ZHELEVA, Army Research Lab, ARMY RESEARCH LAB COLLABORATION — The $Mg_xZn_{1-x}O$ alloy system may provide a new UV optically tunable family of wide bandgap materials. ZnO has the hexagonal wurtzite structure of bandgap $\sim$ 3.3 eV while MgO has the NaCl cubic structure of bandgap $\sim$ 7.5 eV. Bandgap engineered alloys at the range $\sim$ 3.3 – 7.0 were achieved. In this communication we present studies on the UV photoluminescence (PL) and Raman properties of wurtzite $Mg_xZn_{1-x}O$ nanopowders of average size $\sim$ 30 nm that were synthesized via the thermal decomposition method. For the studied composition range of $0 \leq x \leq 0.26$, the room temperature UV-PL was found to be tuned by $\sim$ 0.25 eV towards the UV-spectral range, and the PL emission was established to be due to an excitonic-type recombination mechanism. The first-order LO Raman mode was found to exhibit a blueshift of $\sim$ 33 cm^{-1} and the second-order LO a shift of $\sim$ 60 cm^{-1}. The LO-mode of the nanopowders is discussed in terms of a mixed A_1-E_1 symmetry phonon known as a quasi-LO mode.
[*]L. Bergman, et. al, Appl. Phys. Lett. **88**, 023103 (2006)

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