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On the Formation of Luminescent MgZnO Ceramics with the Hexagonal and the Cubic Phase LEAH BERGMAN, JOHN MORRISON, JESSE HUSO, MICHELLE HUSO, HUI CHE, DINESH THAPA, University of Idaho — Mg(x)Zn(1-x)O is a promising alloy family with UV-tuneable bandgaps, which can have the hexagonal or cubic structure depending on the composition x. ZnO has the hexagonal wurtzite structure and a bandgap of ~ 3.4 eV, while MgO has the NaCl cubic structure and a bandgap of ~ 7.4 eV. Mg(x)Zn(1-x)O can yield bandgaps spanning the range 3.4 eV to 7.4 eV that are achieved via the choice of composition x. We present studies of the optical and material properties of sintered ceramics with two alloy compositions, $x = 0.1$ and $x = 0.6$, to investigate both the wurtzite and the cubic phases. To study the alloying dynamics, the properties as a function of annealing temperature in the range of 600-1100C were investigated. For the low Mg composition ceramic sample it was found that a threshold temperature around 900C is required in order to initiate the formation of the solid solution of MgZnO with the wurtzite structure. The formation of the high Mg composition ceramic sample was found to have a sequence of phases: initially the alloy formed with the wurtzite structure at around 900C, then a transition into the NaCl cubic structure took place at the high temperature regime. Due to such formation, the cubic phase ceramics inherently include defects within the wurtzite structure.

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