

A Study of the Growth of Single-Phase Mg_{0.5}Zn_{0.5}O Films for UV LED

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Abstract : Single-phase, high band gap energy Zn_{0.5}Mg_{0.5}O films were grown under oxygen pressure, using pulse laser deposition with a Zn_{0.5}Mg_{0.5}O target. Structural characterization studies revealed that the crystal structures of the Zn_x-1Mg_xO films could be controlled via changes in the oxygen pressure. TEM analysis showed that the thickness of the deposited Zn_{1-x}Mg_xO thin films was 50-75 nm. As the oxygen pressure increased, we found that one axis of the crystals did not show a very significant increase in the crystallization compared with that observed at low oxygen pressure. The X-ray diffraction peak intensity for the hexagonal-ZnMgO (002) plane increased relative to that for the cubic-ZnMgO (111) plane. The corresponding c-axis of the h-ZnMgO lattice constant increased from 5.141 to 5.148 Å, and the a-axis of the c-ZnMgO lattice constant decreased from 4.255 to 4.250 Å. EDX analysis showed that the Mg content in the mixed-phase ZnMgO films decreased significantly, from 54.25 to 46.96 at.%. As the oxygen pressure was increased from 100 to 150 mTorr, the absorption edge red-shifted from 3.96 to 3.81 eV; however, a film grown at the highest oxygen pressure tested here (200 mTorr).

Keywords : MgO, UV LED, ZnMgO, ZnO

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