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Aerosol Spray Deposited Wurtzite ZnMgO Alloy Films with MgO Nanocrystalline Inclusions

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In this paper $Zn_{1-x}Mg_xO$ thin films with composition range x = 0.00 – 0.80 have been obtained by aerosol spray deposition method on p-Si substrates by using zinc acetate and magnesium acetate as precursors. The produced thin films were characterized by scanning electron microscopy (SEM), energy dispersive X-ray (EDX) analysis, X-ray diffraction (XRD), and optical spectroscopy. SEM images revealed uniform nanocrystalline morphology of films, but the form of nanocrystals vary with variation of the Mg content. XRD analysis suggests that the produced films contain a wurtzite $Zn_{1-x}Mg_xO$ phase in the whole chemical composition range, with cubic phase MgO nanocrystalline inclusions with mean grain size around 20 nm. The optical bandgap was found to vary from 3.4 eV to 5.2 eV with increasing the Mg content from 0 to 60%.