

Effect of the substrate on the properties of ZnO-MgO thin films grown by atmospheric pressure metal-organic chemical vapor deposition

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Abstract

The ZnO-MgO alloys possess attractive properties for possible applications in optoelectronic and display devices; however, the optical properties are strongly dependent on the deposition parameters. In this work, the effect of the glassy and metallic substrates on the structural, morphological and optical properties of ZnO-MgO thin films using atmospheric pressure metal-organic chemical vapor deposition was investigated at relatively low deposition temperature, 500 °C. Magnesium and zinc acetylacetonates were used as the metal-organic source. X-ray diffraction experiments provided evidence that the kind of substrates cause a deviation of c-axis lattice constant due to the constitution of a oxide mixture (ZnO and MgO) in combination with different intermetallic compounds ($\text{Mg}_{20}\text{Zn}_{11}$ and $\text{Mg}_{24}\text{Zn}_7$) in the growth films. The substitutional and interstitial sites of Mg^{2+} instead of Zn^{2+} ions in the lattice are the most probable mechanism to form intermetallic compounds. The optical parameters as well as thickness of the films were calculated by Spectroscopic Ellipsometry using the classical dispersion model based on the sum of the single and double Lorentz and Drude oscillators in combination with Kato-Adachi equations, as well as X-ray reflectivity. © 2011 Elsevier B.V. All rights reserved.

[Thin Solid Films](#)

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