

Characteristics of $Zn_xCo_{3-x}O_4$ Spinel Thin Films

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Extended Abstract

Recently there have been many researches to develop new materials for active transparent electronic devices. Transparent p-n junction diodes for “invisible optoelectronic devices” have a wide range of applications such as smart window and organic lighting diodes. Although both of the n-type and p-type transparent conductive oxides (TCOs) are essential for transparent p-n junction diodes, the application of a transparent p-n junction is far from practical use due to the poor electrical conductivity and the optical transmittance of p-type materials.

In this study p-type transparent semiconducting oxide films of $Zn_xCo_{3-x}O_4$ thin films were deposited on glass and c-sapphire single crystal (0001) substrates by Pulsed Laser Deposition process. The effects of Zn the type of the substrate, substrate temperature and atmosphere on the structural, electrical and optical properties of the $(Zn,Co)_3O_4$ spinel oxide thin films were examined.

The preferred orientation of spinel thin films frequently observed in other spinel thin films such as of $NiOCo_2O_4$, was not observed in these films. The electrical conductivity of the $Zn_xCo_{3-x}O_4$ thin films increased with the increasing Zn-doping concentration. The electrical conductivity of the thin films on glass and sapphire substrates was improved by the introduction of oxygen and increased with increasing substrate temperature. The optical transmittance decreased with the introduction of oxygen gas and increased with increasing substrate temperature.

References

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