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Oxygen effect in Magnetron Sputtered Aluminum doped Zinc oxide films.RAHMANE Saâd¹, Djouadi Mohamed Abdou², Aida Mohamed Salah³, Barreau Nicolas⁴

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Abstract:

In this work, polycrystalline transparent conductive aluminum doped zinc oxide (ZnO:Al) films, have been successfully grown on glass and silicon substrates by rf magnetron sputtering technique at room temperature. The effect of oxygen content in plasma on the structural, optical and electrical properties of the films was systematically studied. The growth rate was found to decrease with the increase in O₂ content. The crystal structure of ZnO:Al films deposited on glass is hexagonal with C-axis preferential orientation, while for film deposited on silicon substrate, the preferred orientation of crystallite shifts from (002) to (100) direction with the increase in O₂ content. Intrinsic stress increases with an increase of oxygen content, and near stress-free film was obtained at 0 % O₂ content. Low resistivity ($r=1.25 \times 10^{-3} \Omega \text{cm}$) associated to high transmittance ($T > 92\%$) in the visible regions, were obtained for ZnO:Al film deposited at room temperature without oxygen content in the deposition chamber. From the optical characterization, we deduced that the band gap shifts towards lower energy with an increase of oxygen content.

Keywords

magnetron sputtering
Al doped ZnO
Thin Films
O₂ content
properties