

Fabrication of Al-doped ZnO Thin Films by Vertical In-line DC Magnetron Sputtering

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Abstract : Al-doped ZnO (AZO) thin films have been fabricated by vertical in-line dc magnetron sputtering for transparent conducting oxides (TCOs) applications. The effects of substrate temperature and dc power on the characteristics of AZO thin films are investigated and also optimized the process conditions to get the best electrical and optical properties. The fabricated thin films show a good electrical and optical uniformity within $\pm 5\%$ over the whole area of substrate (200mm \times 200mm) ; the minimum resistivity of $8 \times 10^{-4} \Omega\text{cm}$ and the average transmittance of 90% within the visible wavelength range. We have found that the band gap (E_g) increases with increasing substrate temperature and dc power, whereas the crystallinity is getting improved with increasing substrate temperature. The binding energy of Zn 2p_{3/2} and O 1s is observed to decrease as the substrate temperature increases.

Key Words : Al-doped ZnO, AZO, Transparent Conducting Oxides, TCOs, Vertical in-line sputtering

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