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A comparative study of growth and properties of atomic layer deposited transparent conductive oxide of Al doped ZnO films from different Al precursors

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Abstract

Transparent conducting oxide of Al-doped ZnO (AZO) films were prepared by atomic layer deposition (ALD) using diethylzinc (DEZ) and 3 kinds of Al precursors, including trimethylaluminum (TMA), aluminium isopropoxide (AIP) and $AlCl_3$. The impact of ZnO/Al_2O_3 cycle ratios from 9:1 to 39:1 and Al precursors on the growth rate, Al dopant concentration, structure, and resistivity of AZO films were investigated deeply. At the same ZnO/Al_2O_3 cycle ratio, the film thickness decreases and the Al dopant concentration increases gradually with TMA, AIP and $AlCl_3$ precursors in turn. Generally, the Al doping leads to poorer crystallinity and better conductivity for AZO films. Both TMA-AZO and AIP-AZO films with 19:1 ZnO/Al_2O_3 cycle ratio show the