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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

Min Li, Xu Qian, Ai-Dong Li*, Yan-Qiang Cao, Hai-Fa Zhai, Di Wu

National Laboratory of Solid State Microstructures, Department of Materials Science and Engineering, College of Engineering and Applied Sciences, Collaborative Innovation Center of Advanced Microstructures, Nanjing University, Nanjing 210093, People's Republic of China

Electronic mail: adli@nju.edu.cn

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 $\text{ZnO}/\text{Al}_2\text{O}_3$ 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 $\text{ZnO}/\text{Al}_2\text{O}_3$ 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 $\text{ZnO}/\text{Al}_2\text{O}_3$ cycle ratio show the

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