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Growth Characteristics and Properties of Ga-doped ZnO (GZO) Thin Films Grown by Thermal and Plasma-enhanced Atomic Layer Deposition

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Highlights

- !! Ga-doped ZnO (GZO) was deposited by using thermal ALD and plasma-enhanced ALD
- !! Properties of GZO were investigated as a function of doping concentration
- !! TMGa was acted as a growth inhibitor below 300°C at Th-ALD
- !! The lowest resistivity can be obtained at maximum Ga solubility of ZnO
- !! Th-ALD GZO can be applicable to electrode of transparent electronics

Abstract

The growth characteristics and electrical and optical properties of gallium-doped ZnO (GZO) grown by thermal atomic layer deposition (Th-ALD) and plasma-enhanced atomic layer deposition (PE-ALD) were investigated as a function of key growth parameters including the growth temperature. While GZO films are generally deposited at high growth temperatures above 300°C, room temperature deposition is possible using PE-ALD. The chemical properties of the films were analyzed by X-ray photoelectron spectroscopy and their electrical properties including the carrier concentration, mobility, and resistivity were investigated by Hall measurements. The lowest resistivity of 1.49×10^{-3} Ω·cm was obtained

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