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Optical Properties of Aluminum Doped Zinc Oxide Thin Film Grown by Remote PEALD[1] XINGYE WANG, MANPUNEET KAUR, ROBERT NEMANICH, Arizona State Univ — Transparent conducting oxides (TCO) are applied in optoelectronic devices and solar cells due to their high transmittance and low resistivity. Al-doped zinc oxide (AZO) film have been considered as a promising alternative to ITO. In this research, we investigated the optical properties of ZnO and AZO thin films deposited by remote plasma-enhanced atomic layer deposition (PEALD) using dimethylaluminum (DMAI) and dimethylzinc (DMZ) precursors. The substrates were double side polished amorphous quartz cleaned with acetone, methanol and dried with UHP nitrogen. Remote PEALD was then employed to deposit $\sim$ 100 cycles of ZnO thin films or AZO thin films (with Al: Zn cycle ratios from 1:6 to 1:2). In situ XPS indicated Al:Zn atomic ratios that increased from 3.2% to 15.9%. Transmittances higher than 90% were measured from $\sim$ 500nm to 800nm for a film thickness of $\sim$ 20nm. XRD showed the films were crystalline on the amorphous substrates. A blue shift in the transmittance cut off was observed, and the optical band gap increased from 3.1 eV to 3.6 eV with increasing aluminum concentration. The results indicate that PEALD-grown AZO thin films are potential candidates for applications in high transparency TCO-based devices.

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