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Scalable Plasma Engineering For Transparent-Conductive Performance Improvment in Al-Doped ZnO Thin Films MANISH KUMAR, LONG WEN, JEON HAN, Sungkyunkwan University, CENTER FOR ADVANCE PLASMA SURFACE TECHNOLOGY TEAM — ZnO has been widely investigated for applications in opto-and nanoelectronics; such as automobile devices (e.g. panel lighting), traffic lights, optical recording media, scanning readers, video game consoles and LEDs. When it is doped, the special characteristics of ZnO-based compounds allow them to be used as a transparent conductor. Here, we present a scalable plasma engineering process based on DC magnetron sputtering for improving the transparent conductive- characterestics in Al doped ZnO thin films. Using a highly confined magnetron system, plasma densities and electron temprature were engineered systematically and its effect on transparent-conductive characeristics of films has been studied using plasma diagnostic tools (using Langmuir probe, optical essision spectraoscopy, current density) and films characterizations. Here, using DC power in similar range of conventional DC magnetron sputtering, present process produces plasma density one order greater and remarkably higher electron temperature. Such plasma conditions lead to good crystalline films with adequate oxygen vacancies, which in turn leads highly repitible resistivities in order of 10-4 Ω cm with average transmittance more than 85% in entire visible region in 200 nm thick films.

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