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# TEXTURED AI-DOPED ZnO (AZO) TCO OBTAINED VIA MAGNETRON SPUTTERING UNDER A NOVEL SOFT-DEPOSITION METHODOLOGY

Transparent conducting oxides (TCOs) like Al-doped Zinc Oxide (AZO) are highly sought after for their unique electrical conductivity and optical transparency combination. AZO offers advantages over ITO and FTO, including processing costs, environmental and health considerations, stability, ease of processing, and versatile fabrication techniques. This work explores the viability of obtaining AZO films under soft deposition conditions via the magnetron sputtering technique. Aside from their exceptional electrical and optical properties, this research reports the obtention of textured AZO using a novel one-step sputtering method. The impact of adjusting the target-to-substrate distance (dTS), argon gas flow (FAr), and sputtering power (PW) was investigated on the ultimate characteristics of AZO films through X-ray diffraction, scanning electron microscopy, UV-vis spectrophotometry, and Hall-effect measurements. Films displaying the most favorable electrical properties (3.2x10-4  $\Omega^{*}$  cm, 21.3 cm2 V-1 s-1, and 9.2x1020 cm-3) were produced at a FAr of 5 sccm, a PW of 45 W, and room temperature. Furthermore, AZO thin films deposited within the high-density zone (HDZ, dTS < 6 cm) of the plasma sputtering exhibited a textured surface with crater-like features, which were more pronounced in films deposited at reduced FAr (5 sccm) and low PW (45 W) values. The obtention of a textured TCO film at soft deposition parameters offers several advantages in film technology by enhancing light management (trapping and scattering), improving film mechanical and chemical stability, increasing surface area, and providing enhanced performance, which could be highly beneficial for the cost-effective production of AZO for its implementation cutting-edge optoelectronic applications such as flexible solar cells and electroluminescent devices.

# Keywords

Textured TCO, Al:ZnO, soft-deposition, sputtering,

### Reference

K. Portillo-Cortez, S.R. Islas, A. Serrano-Lázaro, et al., A novel soft deposition methodology for textured ZnO:Al thin films as efficient transparent conductive oxide layers. Applied Surface Science Advances 9 (2022) 100255. https://doi.org/10.1016/j.apsadv.2022.100255

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