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The route to heaven for sputter deposited AZO

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Aluminium Doped Zinc Oxide (AZO) is a transparent conducting oxide which has been extensively studied as replacement material for Indium Tin Oxide (ITO). Browsing through the literature related to magnetron sputtering as deposition technique, several alternative ways to deposit this material have been proposed, ranging from combinatorial studies using dual magnetron sputtering, over the use of ceramic targets to RF sputtering of metal targets in full poisoning mode. In each of these studies, the electrical and optical properties have been optimized as a function of the deposition parameters. High quality materials have been obtained, but the generality and/or portability to other deposition environments can be an intrinsic problem to these individual studies.

In this study, several of these routes to AZO thin films are compared in detail to find the rationale behind the successes and the failures of each approach. More specific, a comparison between the DC magnetron sputtering deposition of AZO using metal targets and compound targets has been performed. In both cases two magnetron configurations have been used, i.e. a two inch planar cylindrical target, and a small scaled rotating cylindrical target. The crystallographic properties were investigated using XRD (Bragg Brentano configuration). The electrical conductivity was measured by in-line four point probe resistivity measurements, and the optical properties were studied using UV-VIS transmittance measurements. To compare the different routes to AZO, the arriving energy per particle was measured by combining the use of a passive thermal probe to measure the energy flux towards the substrate with the measured film thickness.

Keywords

AZO

magnetron sputtering

rotatable

thin film growth