

Superficial Metrology of Organometallic Chemical Vapour Deposited Undoped ZnO Thin Films on Stainless Steel and Soda-Lime Glass Substrates

Authors : Uchenna Sydney Mbamara, Bolu Olofinjana, Ezekiel Oladele B. Ajayi

Abstract : Elaborate surface metrology of undoped ZnO thin films, deposited by organometallic chemical vapour deposition (OMCVD) technique at different precursor flow rates, was carried out. Dicarbomethyl-zinc precursor was used. The films were deposited on AISI304L steel and soda-lime glass substrates. Ultraviolet-visible-near-infrared (UV-Vis-NIR) spectroscopy showed that all the thin films were over 80% transparent, with an average bandgap of 3.39 eV, X-ray diffraction (XRD) results showed that the thin films were crystalline with a hexagonal structure, while Rutherford backscattering spectroscopy (RBS) results identified the elements present in each thin film as zinc and oxygen in the ratio of 1:1. Microscope and contactless profilometer results gave images with characteristic colours. The profilometer also gave the surface roughness data in both 2D and 3D. The asperity distribution of the thin film surfaces was Gaussian, while the average fractal dimension D_a was in the range of $2.5 \leq D_a$. The metrology proved the surfaces good for 'touch electronics' and coating mechanical parts for low friction.

Keywords : undoped ZnO, precursor flow rate, OMCVD, thin films, surface texture, tribology

Conference Title : ICTIE 2023 : International Conference on Tribology and Interface Engineering

Conference Location : Paris, France

Conference Dates : November 27-28, 2023