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Effects of Composition Ratios and Microstructure on Mechanical and Electrical Properties of AZO – Zincone Nanolaminates Using Atomic and Molecular Layer Depositions

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The combination of ALD and MLD techniques enables the fabrication of various functional organic –inorganic hybrid thin film structures. In this work, Al-doped zinc oxide (AZO) and zincone multi-layers were deposited on polymer substrate using diethylzinc (DEZ) with H₂O and hydroquinone (HQ) precursors. Because the nanolaminates structure of AZO - zincone is consisted with organic and inorganic layers, the mechanical and electrical advantages of those two materials may impact the final properties of hybrid thin films. The characteristics of the hybrid thin film are varied significantly with the change of composition ratios, the thin film microstructure and process conditions. Various nano-structures of hybrid thin film were fabricated by controlling composition ratio and process conditions, and their microstructure and morphology were analyzed. The mechanical properties of hybrid thin films grown on transparent polyimide substrate were characterized by the micro-tensile test. The variation of electrical resistivities of hybrid thin films were also measured during the micro-tensile test, so the reliability of hybrid thin films were analyzed under external deformations. . In addition, the optical transmittance of nanolaminates thin films was also measured with various composition ratios and compared with conventional AZO single inorganic thin film.

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