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Spectroscopic Understanding of Structural and Electrical Property Variations in Dopant-free ZnO Films

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Abstract

Physical property variation in dopant-free ZnO films was investigated. Film annealing under various environments (O_2, in-Air, N_2 and vacuum), resulted in better crystallinity than in the as-grown film. In particular, the film annealed under the N_2 environment showed better crystallinity and electrical properties than films annealed in other environments. Based on spectroscopic analysis, we found a correlation between physical (structural, electrical) and chemical properties: The crystallinity of ZnO films is closely related to Zn-O bonding, whereas carrier concentration is associated with V_O (oxygen vacancy).

Keywords: ZnO films; Annealing; Oxygen vacancies; Environmental stability

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