
Improving Piezoelectric Properties of ZnO Thin Films Deposited via AP-SALD with Texture Enhancement

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Abstract

Zinc oxide (ZnO) has emerged as a promising piezoelectric material due to its abundance, ease of production, and non-toxicity. This study presents a novel approach to depositing ZnO thin films using the Atmospheric-Pressure Spatial Atomic Layer Deposition (AP-SALD) method onto a Si(100) substrate. This method, notable for its scalability and rapid deposition rates, offers significant advantages over traditional chemical vapor methods, achieving superior efficiency and speed, particularly for piezoelectric applications.

The influence of substrate temperature on the deposition of textured ZnO films was systematically examined, independent of dopants or specific substrates. The results reveal that the AP-SALD method enables the fabrication of well-textured ZnO films at relatively low temperatures, approximately 240 °C, demonstrating a threefold enhancement in piezoelectric amplitude compared to traditional methods.

Pole figure analysis further shows that texturization is not the sole contributor to the piezoelectric enhancement, suggesting other factors at play. This research unlocks potential for the development of efficient, cost-effective piezoelectric devices. The findings could significantly impact diverse technological fields to utilize the unique properties of ZnO.

Keywords: textured ZnO, thin film, piezoelectricity, SALD

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