

Growth of highly c-axis oriented ZnO nanorods on ZnO/Glass substrate: Growth mechanism, Structural and Optical properties

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Abstract:

Highly c-axis oriented ZnO nanorods were grown on ZnO/glass substrates via simple thermal evaporation process by using metallic zinc powder in the presence of oxygen. The nanorods were characterized in detail in terms of their structural and optical properties. The detailed structural investigations revealed that the as-synthesized ZnO nanorods are well-crystalline, possessing a perfect hexagonal ideal growth habits of wurtzite zinc oxide and grown along the [0001] direction in preference. The optical properties were examined by room-temperature photoluminescence (PL) and Raman-scattering analyses which confirmed that the as-grown nanorods exhibiting good optical properties. Interestingly, it was observed that the thin film of ZnO play an important role in the c-axis oriented growth of ZnO nanorods due to lattice match between the thin film and nanorods. The highly aligned ZnO nanorods were grown in very high-density and two adjacent nanorods coalescence and special lath-like crystals were obtained. A plausible growth mechanism has also been proposed for the formation of highly aligned ZnO nanorods based on crystallographic habits of wurtzite hexagonal ZnO.

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