

Morphology and Optical Properties of ZnO Epitaxial Layers on Growth Interrupted Buffer Layers by Plasma-Assisted Molecular Beam Epitaxy

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ZnO epitaxial layers were grown on ZnO buffer layers/p-type Si (100) substrates by plasma-assisted molecular beam epitaxy (PA-MBE). The ZnO buffer layers were grown with different interrupts (0, 4, 9, and 19 cycles) in oxygen plasma. The interrupts of the ZnO buffer layers in samples was kept constant in 2 min. X-ray diffraction (XRD), scanning electron microscopy (SEM), photoluminescence (PL) were carried out to investigate the structural and optical properties of the ZnO epitaxial layers. The ZnO (100) and the shoulder peak around 33.3° were shown from the ZnO epitaxial layers grown on the ZnO buffer layers with growth interruption above 9 cycles in XRD spectra. The sample show various surface morphology such as columnar, flat, and rough shape with various growth interruptions cycles. For the deep-level emission (DLE) in PL spectra, the relatively large change of the energy was observed as the interrupts were increased from 9 to 19 cycles while the energy was slightly shifted to lower energy as the interrupts were increased to 9 cycles. The DLE was shifted to orange emission region as the growth interruption cycles were increased.