

**X-RAY DIFFRACTION CHARACTERIZATION OF MOVPE ZnSe
FILMS DEPOSITED ON (100) GaAs USING CONVENTIONAL AND
HIGH-RESOLUTION DIFFRACTOMETERS**

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ZnSe-based heterostructures grown on GaAs substrates have been investigated for use in pin-diode LED applications. ZnSe has a large band gap, 2.76 eV, as well as a near lattice match to GaAs, 5.669 Å vs. 5.654 Å, respectively. In this study a metallorganic vapor phase epitaxy (MOVPE) deposition technique is used to produce doped and undoped thin films of ZnSe on (100) GaAs.

Understanding the effect of deposition parameters on the crystallographic quality of the ZnSe films is important for optimizing the performance of these devices. X-ray diffraction is well suited for analyzing epitaxial thin films deposited on single-crystal substrates. In this study a conventional Bragg-Brentano diffractometer (BBD) has been used to screen samples for phase identification, crystallite size, presence of polycrystalline ZnSe, and initial rocking curve (RC) analysis. A limitation of the conventional diffractometer is that the smallest RC full width at half maximum that can be achieved is 500–600 arc seconds. As deposition parameters are optimized and the RC limit of the conventional diffractometer is reached, analysis is moved to a 4-bounce high-resolution diffractometer (HRD). Although more time for analysis is required, using the HRD has an RC resolution advantage, where RCs of <20 arc seconds are obtained for neat GaAs wafers.

Combining the BBD and HRD instruments for analysis of ZnSe films grown on GaAs substrates allows for an efficient means of high sample throughput combined with an accurate measurement of film alignment.

