

# **STRUCTURAL AND ELECTRICAL CHARACTERIZATION OF UNDOPED GaAs EPITAXIAL LAYERS GROWN BY LOW PRESSURE METAL ORGANIC VAPOR PHASE EPITAXY**

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The epitaxial growth of binary, ternary, quaternary compound semiconductors has been successfully grown in the recent past by Metal Organic Vapor Phase Epitaxy (MOVPE). Devices with high quality operating characteristics require not only appropriate growth technique, but also high quality epitaxial layers are necessary.

Undoped GaAs epitaxial layers were grown by low pressure horizontal MOVPE reactor. The details of the growth process is described elsewhere [1]. The grown films were characterized in terms of structure, surface morphology, background impurity distribution with depth. The morphology of MOVPE grown GaAs films were seen by Scanning Electron Microscopy (Fig.1). It may be seen from the figure that the film exhibits a uniform smooth surface and a dense cross-section. Also, one may observe a clear interface between the film and the substrate. The compositional homogeneity of the films was quantified in terms of estimating the Ga/As ratio, using Energy Dispersive Analysis of X-ray (EDAX) analysis. High Resolution Transmission Electron Microscopy (HRTEM) selective area diffraction studies (Fig.2) exhibit the growth along the [100] direction of GaAs substrate. The lattice indexing of HRTEM is also used to visualize the atomic arrangements inside the crystal (Fig.3).

Electrical characterization can give considerable information about the purity of the grown undoped GaAs epitaxial layers. Such information is important for the growth process as well as the high quality epitaxial material for device application. Hall effect by Van der Pauw method was utilized to measure the mobility of grown sample. The mobilities of the n-type and p-type materials were  $4500 \text{ cm}^2/\text{V}\cdot\text{sec}$  and  $350 \text{ cm}^2/\text{V}\cdot\text{sec}$ , respectively at room temperature. BIO-RAD Electrochemical CV Profiler were utilized to measure the I-V, C-V and depth profiling. A typical I-V characteristics of undoped GaAs layer is shown in Fig.4, which may be found consistent with the data present in the literature [2]. Fig.5 shows a typical background concentration versus depth for our as grown undoped sample. More details on electrical properties would be emphasized.