

MOVPE GROWTH OF GaAs USING TRIMETHYL-GALLIUM AND ARSINE

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MOVPE is widely used for the epitaxial growth of GaAs and related compounds[1-2]. In this paper, we report the growth and characterization of GaAs epitaxial layers. The reactor used for the growth runs was procured from M/S CVD Equipment Corporation, USA. It consists of five MO lines and four hydride lines and is capable of doing growth runs from 10 Torr to 760 Torr. Also, it has inbuilt safety and alarm system. GaAs homoepitaxial layers were grown using trimethylgallium(TMGa) and arsine(AsH₃) as source materials for MOVPE. Growth runs were carried out with the following parameters.

Substrate temperature : 700 °C
Total pressure inside the growth chamber : 100 Torr
III/V ratio, : 40

Mirror like surfaces are readily achieved. Scanning Electron Microscopy (SEM) and optical microscopy are utilized to observe the surface morphology of epilayers and thickness of the film. Fig 1 shows the SEM picture of grown layer featuring a epilayer thickness of about 4 μm.

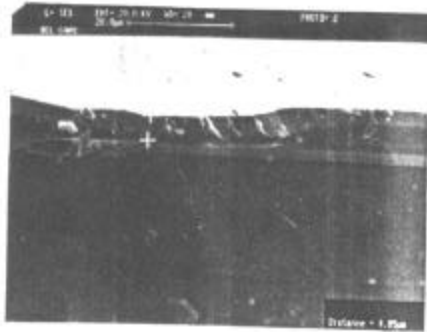


Fig.1.SEM picture of grown epilayer

p-type GaAs layers were obtained with a growth rate of about 4 μm/hr. The resistivity of GaAs epitaxial layer was measured by Van der Pauw method. The measured carrier concentration 10^{15} - 10^{16} cm⁻³ and the Hall mobility at 300K was 100 cm²/V-sec. Photoluminescence(PL) spectra of undoped GaAs layers were recorded at 4.2K. Fig.2 shows the PL spectrum of GaAs layer at 4.2K. These spectra indicate that carbon is the dominant residual impurity in the undoped material[3].

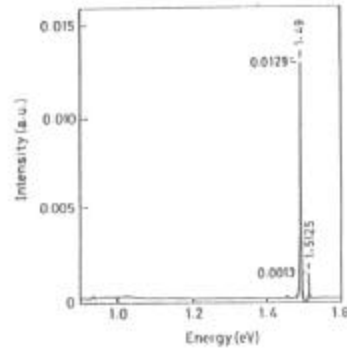


Fig.2 PL spectrum of GaAs at 4.2K

I-V, C-V as well as depth profiling of the undoped GaAs layers were obtained using the BIO-RAD Polaron (PN4300PC) electrochemical profiler. Fig 3 shows the depth profiling of the grown layer measured using the electrochemical profiler.

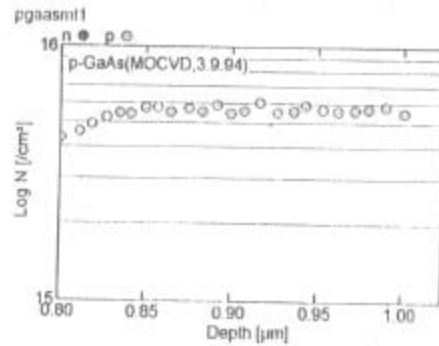


Fig.3.Depth profiling of undoped grown layer.

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