

Structural characterization by HRXRD and Raman scattering of $\text{Al}_x\text{Ga}_{1-x}\text{Sb}/\text{GaSb}$ heterostructure

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Abstract: - High resolution X-ray diffraction profiles were obtained from $\text{Al}_x\text{Ga}_{1-x}\text{Sb}$ layers grown on (001) GaSb substrates by Liquid Phase Epitaxy (LPE). The out of plane lattice parameter was estimated directly from the asymmetrical diffractions (115) and (-1-15) alloy. These results show that some of the layers are more strained than others. The out of plane lattice parameter as a function of Al content is higher than the corresponding bulk lattice parameter of $\text{Al}_x\text{Ga}_{1-x}\text{Sb}$ layers obtained with Vegard's law. Two peaks are observed in their Raman spectra over this composition range. The assignment of the observed modes to GaSb-like is discussed.

Key-Words: - Ternary alloy; Liquid phase epitaxy; X-ray diffraction; Raman Scattering; AlGaSb ;

1 Introduction

Some years ago the research of several III-V semiconductor alloys is associated with the wavelength of the optical fiber loss minima (0.8 μm). In particular, gallium antimonide (GaSb) is interesting as a potential substrate material for devices in the band-gap range of 0.3-1.58 eV [1,2] and its related compounds are of interest as low band gap materials with applications in devices operating in the infrared range. For this reason, it is necessary to improve the quality of GaSb and its alloys and to get a deep knowledge of their physical properties [3,4].

High resolution X-Ray diffraction (HRXRD) is applied in the investigation of epitaxial structures of semiconductors [5]. The lattice parameters of semiconductor alloys gradually change with the

chemical composition giving rise to an increase of strain until mismatch dislocations appear lead to the relaxation of the thin film.

Raman scattering is well known as a useful means of investigating the structures in semiconductors. Raman scattering (RS) can give effective information about various crystalline structures from single crystalline to amorphous samples. A number of Raman studies on single crystalline GaSb samples [6-8] and amorphous GaSb samples [9-11] have been reported.

In this work we present the study of the $\text{Al}_x\text{Ga}_{1-x}\text{Sb}$ thin films. The samples were grown by liquid phase epitaxy (LPE) technique. The structural characterization was made by HRXRD and RS.