[II-17]

광루미느센스와 쌍결정엑스선 회절 mapping 방법을 이용한 MBE 성장된 AlGaAs 에피층의 특성 분석

(Chracterization of the MBE Grown AlGaAs Epitaxial Layer using Photo-luminescence and Double Crystal X-ray Diffractormeter Mapping Techniques)

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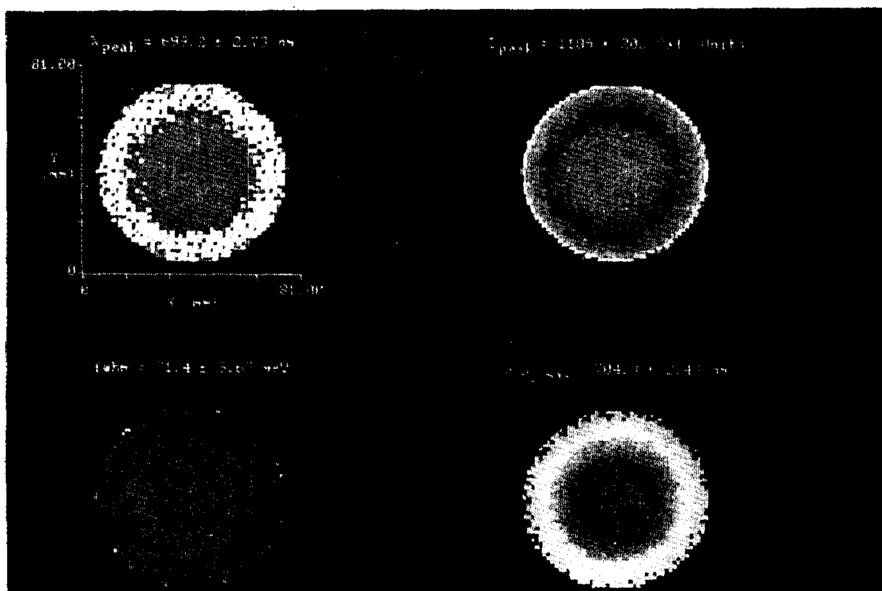
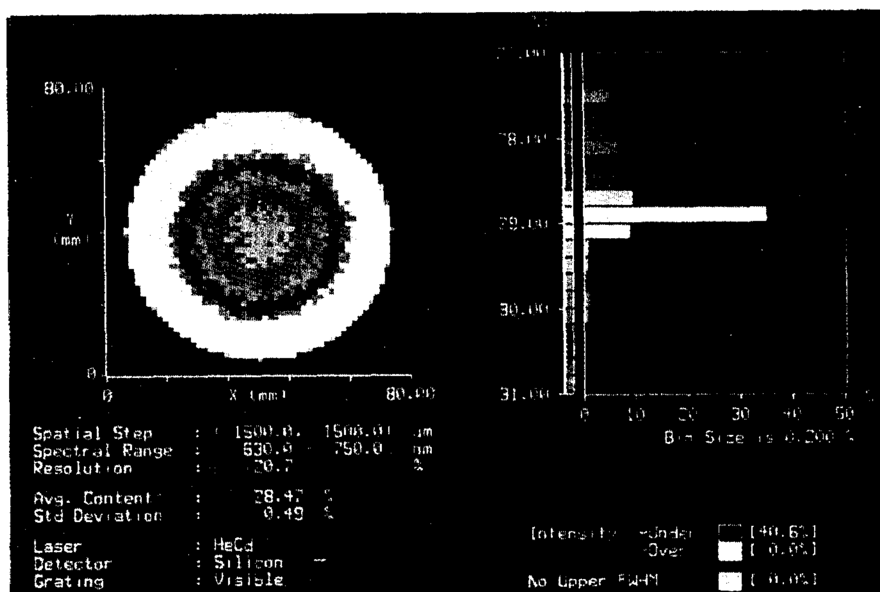
The compound semiconductor has become an important material due to it's application in high frequency and optoelectronic devices. To get high quality of compound semiconductor device, many characterization techniques are often used. Especially, photoluminescence (PL) and double crystal x-ray diffractometer (DCXRD) techniques have a great advantage because these are non-destructive analysis techniques and non-contact methods. Futhermore, up to 5 inch diameter of whole wafer can be measured easily and rapidly using these methods.

In this study, we have obtained a wafer scale map for the characterization of compound semiconductor (3" Si doped $Al_{0.28}Ga_{0.72}As/GaAs$) using PL mapping and DCXRD mapping techniques. A summary of the PL spectroscopic mapping is shown in (Fig. 1) including I_{peak}, λ_{peak}, FWHM, and $\lambda_{+1/2\,max}$. Al composition of the AlGaAs epi-layer calculated from the upper half-height wavelength data and film thickness map are shown in (Fig. 2) and (Fig. 3), respectively. (Fig. 4) represents a summary of the DCXRD mapping results, including epilayer intensity and substrate intensity at peak rock angle, peak angle seapration, substrate FWHM, and epilayer FWHM. The epilayer FWHM and intensity maps follow the same general form as the substrate data, showing how substrate quality influences the epitaxy.

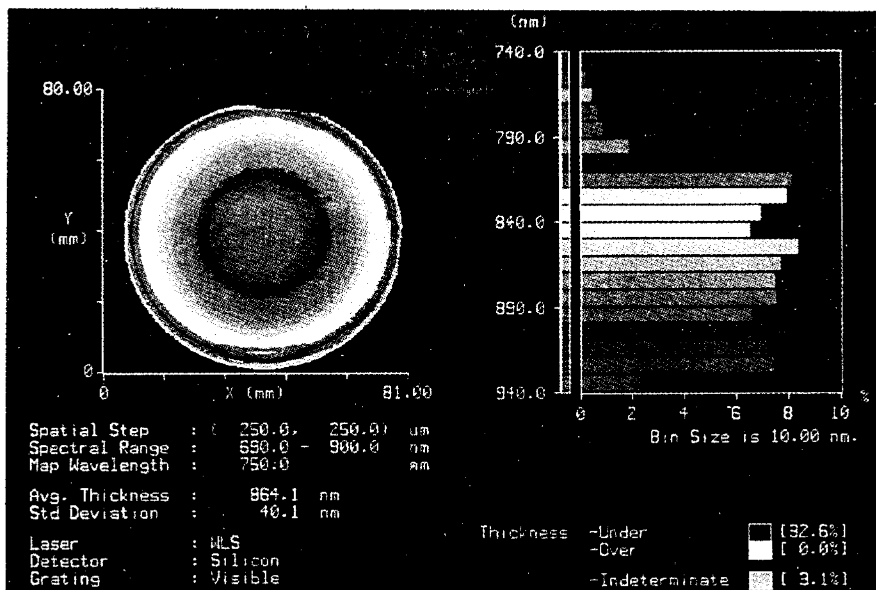
From the above results, we could estimate the quality of the wafer, i.e., Al composition and distribution, optical quality of epitaxial layer and substrate, structure information, etc.. These techniques will be very useful for the monitoring of compound semiconductor process and also helpful to increase the production yield.



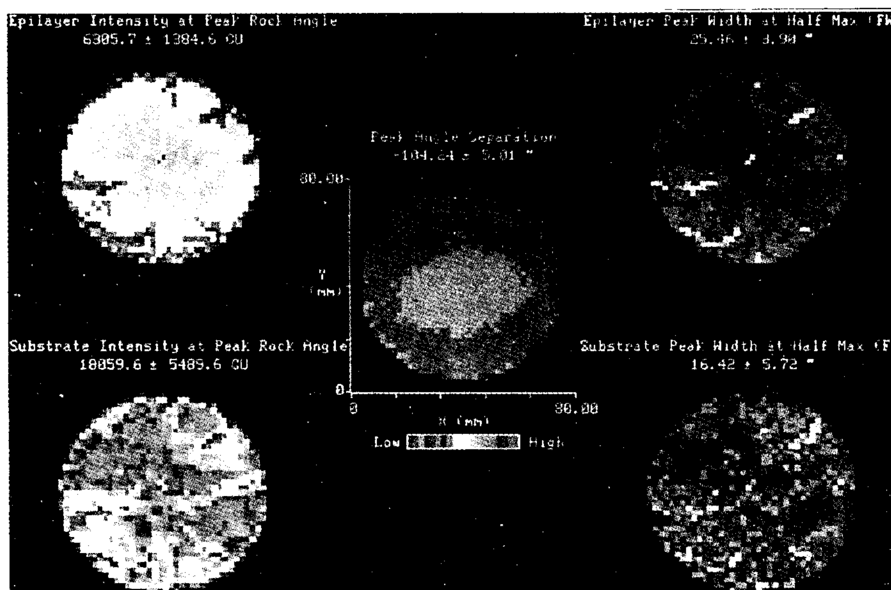
(Fig.-1). A summary of the PL spectroscopic mapping of the AlGaAs/GaAs sample using a 1,500 micron grid.



(Fig.-2). Al composition of the AlGaAs epi-layer calcualted from the upper half-height wavelength data.



(Fig.-3). Film thickness map of the AlGaAs/GaAs wafer.



(Fig.-4). Summary of the DCXRD mapping of the AlGaAs/GaAs wafer.