Probing Interface Strain With X-ray Bragg-Surface Diffraction

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Epitaxially grown Au films on semiconductor substrates, especially on GaAs single-crystals, have a wide variety of applications in the semiconductor industry. It has been yet very difficult to apply modern electron microscopy such as scanning tunneling microcopy and transmission electron microcopy in studying the interface structure since the interface is buried under an over-layer film. Moreover, the grazing incidence X-ray diffraction frequently used for characterization of surfaces/interfaces may encounter difficulties when the incident X-rays propagate from a lower refractive index medium into a higher one.

To overcome this difficulty, we adopt the three-wave Bragg-surface diffraction technique to investigate the effects of interface on the formation of diffraction images. From the angular positions of the diffracted images the variation of lattice constants parallel and normal to the interface can be determined. The experiment is carried out at NSRRC. The Bragg- surface diffraction used is the GaAs(006)/(1-13), where (006) is a symmetric Bragg reflection and (1-13) is a surface diffraction. The photon energy employed is 11.07 keV. Details about the analysis of strain will be reported.

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