B12

고분해능 X-선 회절을 이용한 이종접합 분석
(High Resolution X-ray Diffraction of Heteroepitaxy)

김 형문, 김 상기, 조 경익

한국전자통신연구소 반도체연구단 물성분석실

Double crystal X-ray diffraction is a well-established non-destructive method for the structural assessment, such as composition, thickness, and strain profile, of single or multi epitaxial and superlattices layers. However, a conventional single crystal X-ray diffractometer has a finite angular divergence, depending on the size of collimating slits, the distance between the X-ray source and a slit, and its divergence affects on the linewidth of a single crystal rocking curve (typically several hundreds arc seconds or more). Such a large linewidth is not suitable for X-ray study of the AlGaAs/GaAs system or other lattice-matched systems.

We discuss two beam conditioning techniques such as non-dispersive (or parallel, + -) and dispersive (or anti-parallel, + +) arrangements in double crystal diffraction, and the applicability to the high resolution X-ray diffraction using their characteristics so as to be suitable for the characterization of thin, nearly lattice-matched heteroepitaxial layers or superlattices. We present the X-ray interference method to non-destructively analyze strained quantum well structures.

For example, in the InGaAs- and AlGaAs- multilayer structures, both the experimental and calculated rocking curves exhibit an interference effect within the substrate Bragg peak profile. This effect is mainly due to the phase difference between the wave reflected by the GaAs cladding layer and that by the substrate. This technique is very effective in analyzing the multilayer structure containing the buried strained layer with sub-monolayer thickness resolution.