

Intrinsic Hetero-interface Structures and Their Formation

Yoshikazu Takeda

(Nagoya University, Department of Crystalline Materials Science, Professor)

【Outline of survey】

Precise control of the hetero-structures is essential to fabricate high performance devices, and the size of the devices is becoming smaller and smaller. The shrinkage of the size means the increasing importance of the hetero-interfaces in the whole device structure. However, there has been no research on the relationship between hetero-interface structures and device performances. The reason is clear, *i.e.*, no technique was available to investigate the varied hetero-structures in the atomistic scale.

We believe the only technique for the investigation is the X-ray CTR scattering measurement and analysis. We have been the only group who can fully use the technique and developed the technique for a wide range of the materials and heterostructures.

Our final target is to clarify the hetero-structures, to control it and to improve the device performances.

【Expected results】

- The high performance X-ray CTR scattering measurement system that uses laboratory X-ray sources is developed.
- The hetero-structure formation is clarified *in situ*.
- The hetero-interface structure is controlled.
- The relationship between the hetero-structure and device performance is clarified.

【References by the principal researcher】

- X-ray characterization of epitaxial layers; Y. Takeda and M. Tabuchi in *Advances in Crystal Growth Researches*, pp. 320-336 (Elsevier, Amsterdam, 2001).
- Monolayer scale analysis of heterostructures and interfaces by X-ray CTR scattering and interferences; Y. Takeda and M. Tabuchi in *InP and Related Compounds*, pp. 459-512 (Gordon and Breach, London, 2000).
- Hetero-epitaxy and hetero-structures - Observation of varied structures - ; Y. Takeda and M. Tabuchi, *OYO BUTURI*, **71**, pp. 529-535 (2002). (in Japanese)
- Growth process of nitrides on sapphire substrates observed by X-ray CTR scattering and reflectivity; M. Tabuchi, T. Takeuchi, H. Amano, and I. Akasaki, *Surface Science*, **21**, pp. 162-168 (2000). (in Japanese)

【Term of project】 FY2006 - 2010

【Budget allocation】 30,300,000 yen

【Homepage address】

<http://mercury.numse.nagoya-u.ac.jp/f6/>