

**GRAZING INCIDENCE DIFFRACTION STUDY OF EPITAXIAL FILMS
USING EXTENDED ROCKING CURVE ANALYSIS**

Aya Takase and Kazuhiko Omote

Rigaku Americas Corporation

9009 New Trails Drive, The Woodlands, TX 77381-5209

Rocking curve analysis is widely used to study multilayer structure of epitaxial films including IV, III-V, and II-VI semiconductor materials and nitrides. The grazing incidence geometry using asymmetric reflections is often employed to reduce the x-ray's penetration depth and increase the diffraction intensity from thin surface layers as well as symmetric reflections.

However, the conventional calculation based on the two-wave approximation starts to fail as the scattering angle becomes far away from the Bragg condition and/or the incident angle becomes small and close to the total reflection region. This is because the calculation assumes that the scattering angle is close to the Bragg condition and the incident and diffracted beams are the only dominant x-rays. This problem can be avoided by applying the extended rocking curve theory that does not assume that the scattering angle is close to the Bragg condition and includes the total reflection x-rays as the third wave in the calculation.

Examples of grazing incidence rocking curve analysis using the extended rocking curve theory will be demonstrated in this presentation. The high resolution x-ray diffractometer, SmartLab, was used for data collection and extended rocking curve analysis software, GlobalFit, was used for the layer structure analysis.