s10.m2.o5 **Grazing excidence diffraction versus grazing incidence diffraction for strain/stress evaluation in thin films.** A. Njah, T. Wieder, H. Fuess. *Technische Universität Darmstadt, FB Materialwissenschaft Petersenstr. 23, D-64287 Darmstadt, Germany.*
Keywords: powder diffraction, microstructure analysis.

Grazing incidence X-ray diffraction (GIXD) is a commonly used method for strain/stress evaluation in thin films. Several designs for diffractometers suitable for GIXD have been given based either on a diffractometer in Seemann-Bohlin geometry (SBG) or a diffractometer in Bragg-Brentano geometry. However, GIXD is also connected with a certain disadvantage, in particular for evaluation of residual strains and stresses (RSE) in thin films: The small angle of incidence γ_i causes difficulties in the proper diffractometer alignment. The main problem is the position of the sample with respect to the focusing circle. Any deviation Δr from the correct position tangential at the focusing circle (with r = 0) will cause a reflection shift $\Delta 2\Theta$. This reflection shift is proportional to $1/\sin(\gamma_i)$, resulting in a large $\Delta 2\Theta$ for small γ_i.

In this work, we examine the suitability of Grazing Excidence X-ray Diffraction (GEXD) for RSE. Our idea was to examine whether GEXD is less sensitive to alignment errors, in particular with respect to Δr. We tested GEXD for RSE.

We have found that the reflection shift $\Delta 2\Theta$ for GIXD and for GEXD in BBG are respectively:

$$? 2T = \frac{? r}{R_d} \frac{\sin(2T)}{\sin(?_i)}, \quad ? 2T = \frac{? r}{R_d} \frac{\sin(2T)}{\sin(2T - ?_e)}$$

where γ_e is the angle between the sample surface and the diffracted beam.

For residual strain/stress evaluation using a Bragg-Brentano type diffractometer, the radial sample displacement causes in GEXD a notable less error than in GIXD.

Notes