

GÖBEL MIRRORS FOR X-RAY REFLECTOMETRY INVESTIGATIONS

Göbel Mirror - parallel beam - reflectometry - thin films - D5000

A coating of $\text{In}_2\text{O}_3/\text{Ag}/\text{In}_2\text{O}_3$ on glass was investigated using the x-ray reflectometry technique. The used experimental set-up is given in the table below. First, a conventional reflectometry measurement was made with a secondary monochromator to remove the bremsstrahlung and the $\text{Cu K}\beta$ radiation. The measurement was then repeated with a parabolic Göbel Mirror mounted in the primary beam path. In this case, the secondary monochromator is not necessary because the Göbel Mirror separates pure $\text{Cu K}\alpha$ radiation. The results are shown in Fig. 1. The intensity is plotted on a logarithmic scale as a function of the incident angle. Both measurements were composed of five angular ranges with different measurement parameters up to 3° incident angle. In that way, about seven orders of magnitude in intensity were examined. For both measurements the measuring parameters were identical, except for the step time which was selected to obtain similar counting statistics within each range. The step size was 0.005° . The overall measuring time was 5 hours for the conventional measurement. Using the Göbel Mirror only 38 minutes were necessary to collect data with the same counting statistics.

Fig. 2 shows both measurements on a linear intensity scale. Each reflectivity curve is split into five parts. To make the interference fringes visible, the intensity of each part is scaled by the number given on the figure. Both measurements show nearly the same absolute intensity. In other words, using the Göbel Mirror enabled comparable data to be collected in only one eighth of the time for the conventional reflectometry measurement.

Bruker D5000 Reflectometry configuration

- $\theta/2\theta$ configuration
 - Cu long fine focus tube
 - Reflectometry sample stage
 - $10\ \mu\text{m}$ between sample surface and knife edge
 - Secondary soller slit
 - 0.03° detector slit
 - Scintillation counter
 - with parabolic Göbel Mirror
- or
- with graphite secondary monochromator

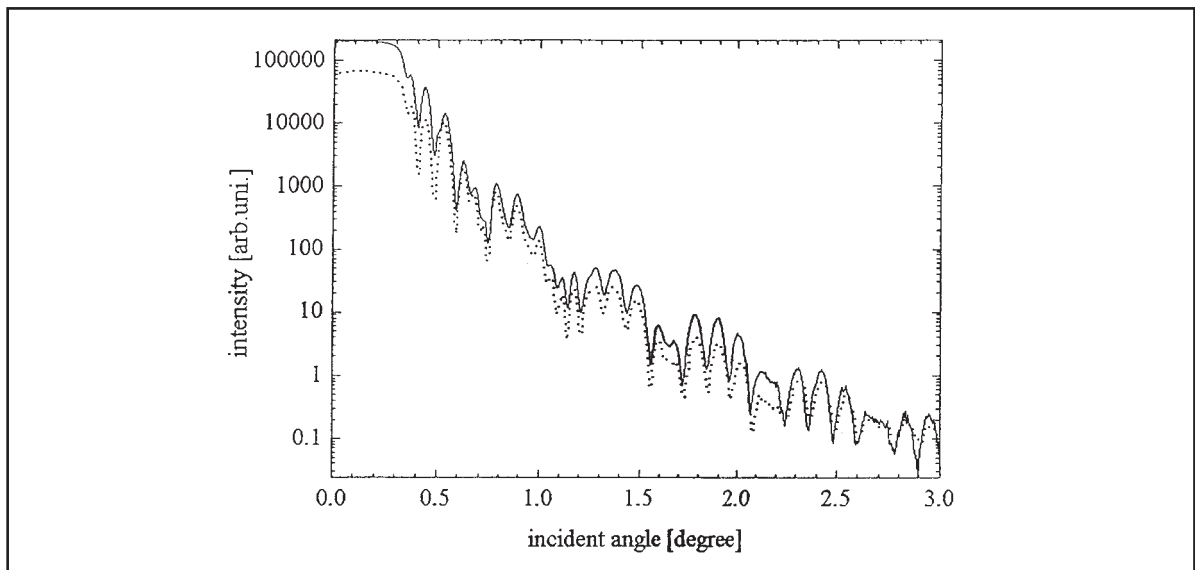


Figure 1– Reflectometry measurements of an $\text{In}_2\text{O}_3/\text{Ag}/\text{In}_2\text{O}_3$ coating on glass made with (solid line) and without (dotted line) the Göbel Mirror. The total measuring time was eight times shorter in the case of the Göbel Mirror measurement.

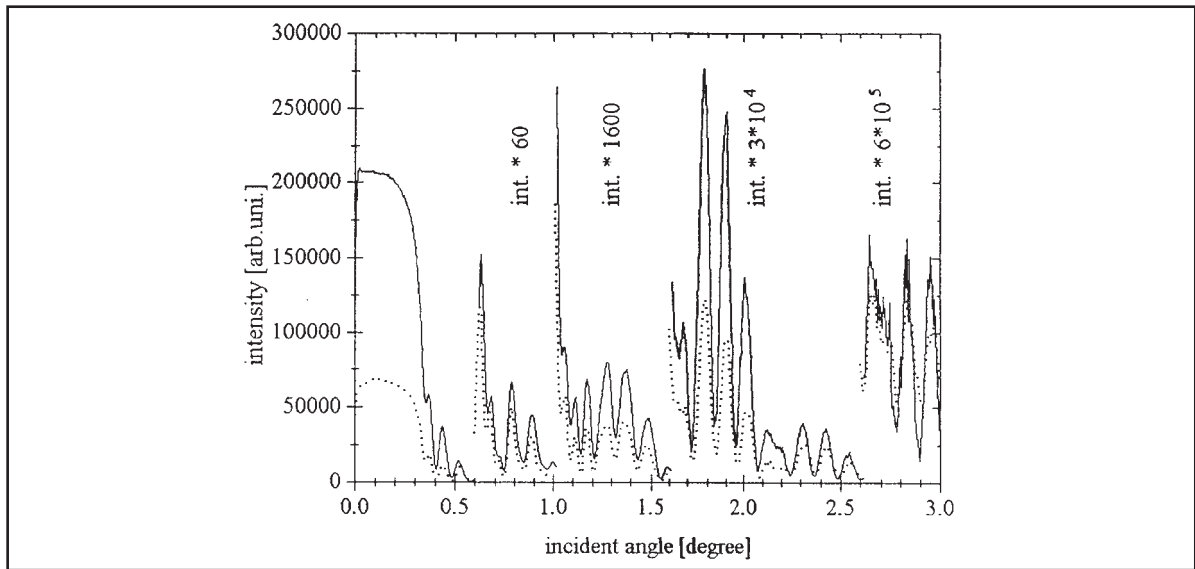


Figure 2 – Reflectometry measurements of an $\text{In}_2\text{O}_3/\text{Ag}/\text{In}_2\text{O}_3$ coating on glass made with a Göbel Mirror (solid line) and without (dotted line). The intensity scale factors are shown.

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