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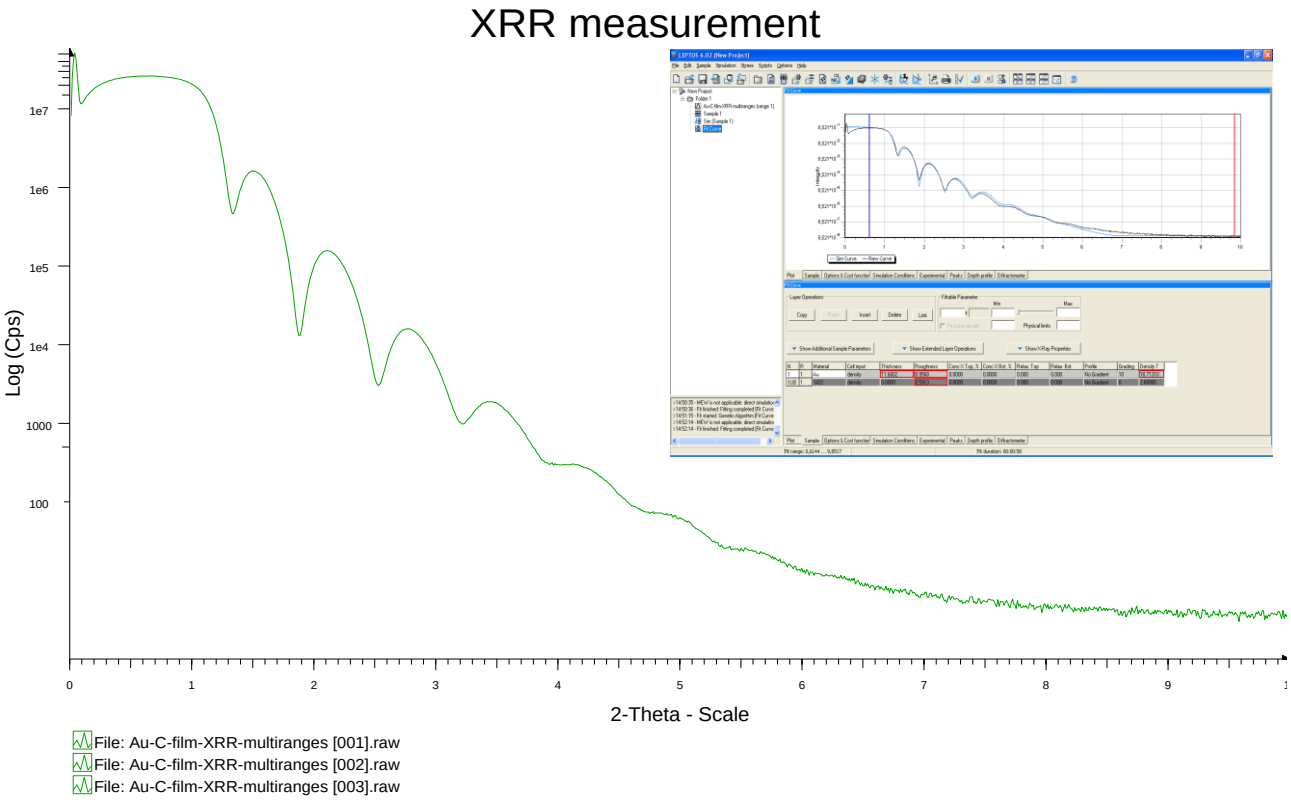
XRD APPLICATION NOTE: X-RAY REFLECTOMETRY (XRR) AND GRAZING INCIDENCE OF DIFFRACTION (GID)

Both X-Ray Reflectometry (XRR) and Grazing Incidence of Diffraction (GID) provide critical information about the crystalline phases present at or near the surface of a fabricated body.

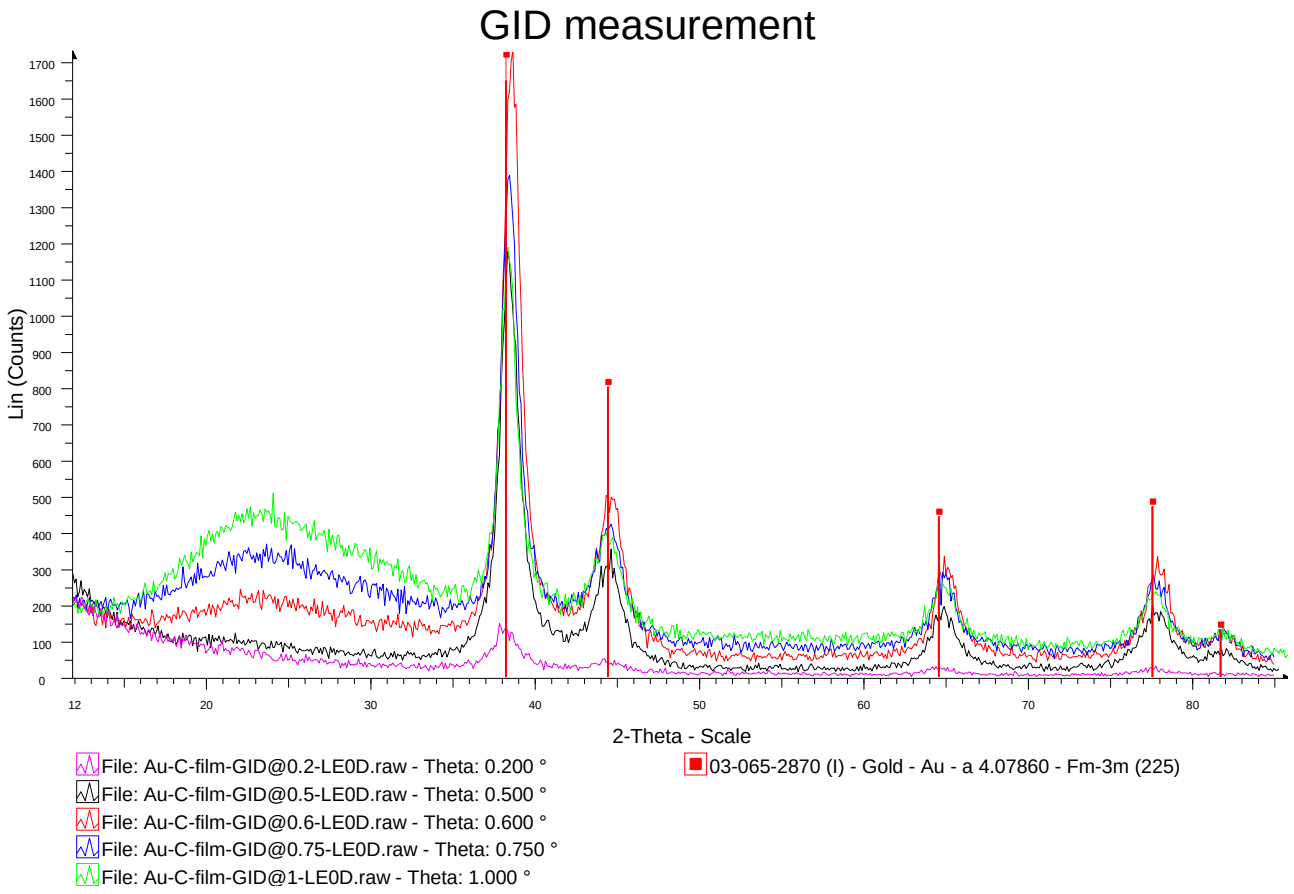
EXAMPLE

A thin film of gold is deposited on a polished glass slide and evaluated using both techniques.

XRR gives critical information about the thickness, number of layers, density and roughness of surface layers by collecting data very close to the critical angle of a material (usually with a glancing angle of less than 0.7°). Data is collected to approximately 8° two theta, in a symmetrical theta-two theta scan. The collected data is modelled using the programme Leptos R; the refined thickness of gold was found to be 11.7 nm with a roughness of 1 nm.



GID is carried out as an asymmetric scan; the incident beam is kept at a low angle and data collected by movement of the detector arm alone. This data collecting method allows for profiling of the crystalline phases present in an object with depth. GID data clearly shows that with increasing angle of incidence, the beam starts to penetrate deeper than the 11.7 nm of gold deposited at the surface; a pronounced glass background is observed at 23° two theta. This method estimates the layer thickness to be approximately 20 nm.



GID can be used to non-destructively identify the crystalline nature of a layer structure and the thicknesses present. Data can be readily coupled with chemical profiling; SEM/EDA or DSIMS.