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Characterization of a multilayer x-ray waveguide by x-ray diffuse scattering and grazing incidence x-ray fluorescence

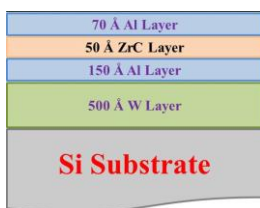
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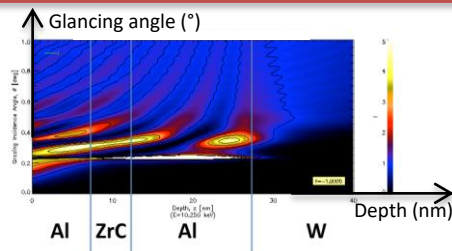
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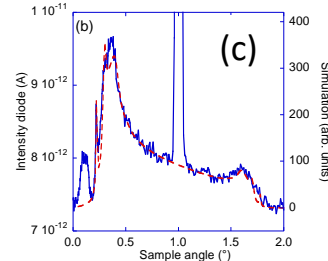
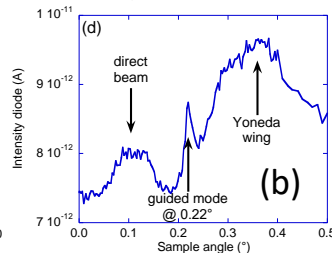
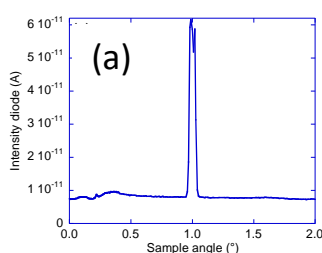
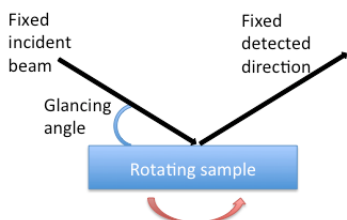
Sample
Al / ZrC / Al / W / Si substrate
prepared by magnetron sputtering

Measurements
Métrologie beamline @ SOLEIL
CASTOR setup



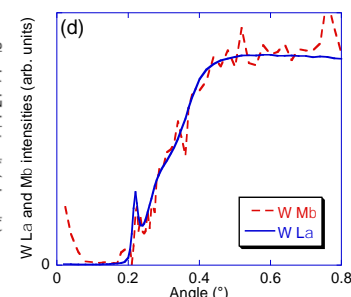
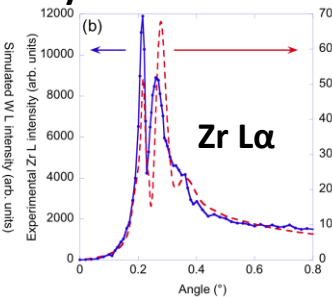
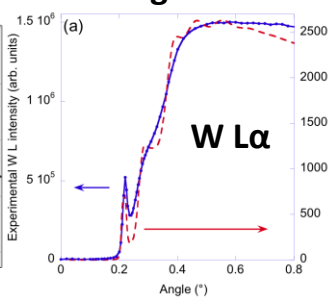
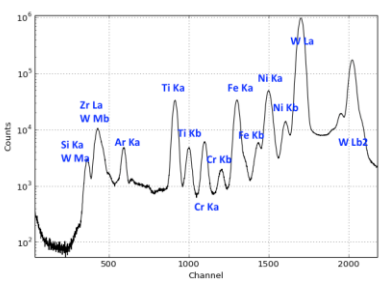
Wave guide
Angular and depth distribution of the electric field for an incident radiation of 10.25 keV

Diffuse scattering



Geometry of the **diffuse scattering** experiment and scattering curves measured at 10.25 keV. The detector is at 2° from the incident direction. (a): whole scanned range. (b): angular range where the guided mode feature is present. (c): comparison between experiment (solid line) and simulation (dashed line).

Grazing incidence x-ray fluorescence



X-ray emission spectrum of the sample measured by a SDD (left). Comparison of the experimental (solid-dotted line) and simulated (dashed line) **GIXRF** curves of W La (a) and Zr La (b); (d) W La and W Mb curves plotted on a common intensity scale. Measurements are performed at 10.25 keV.

Conclusion

The combination of diffuse scattering and GIXRF results puts constraints on the fit process and makes us expecting a precise description of this Al/ZrC/Al/W planar waveguide.

	Thickness from design (nm)	Thickness from GIXR - XDS (nm)	Diffuseness from GIXR - XDS (nm)	In-plane correlation length (nm)
Al	5	7 ± 1	2.8 ± 0.2	20 ± 10
ZrC	7	8.0 ± 0.5	2.8 ± 0.2	30 ± 5
Al	15	20 ± 1	2.8 ± 0.2	20 ± 10
W	50	50	-	-