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XRR-GIXRF combined characterization of Mg/Sc multilayer

Hina Verma¹, Karine Le Guen¹, Yves Ménesguen², Renaud Delaunay¹, Marie-Christine Lépy², Philippe Jonnard¹

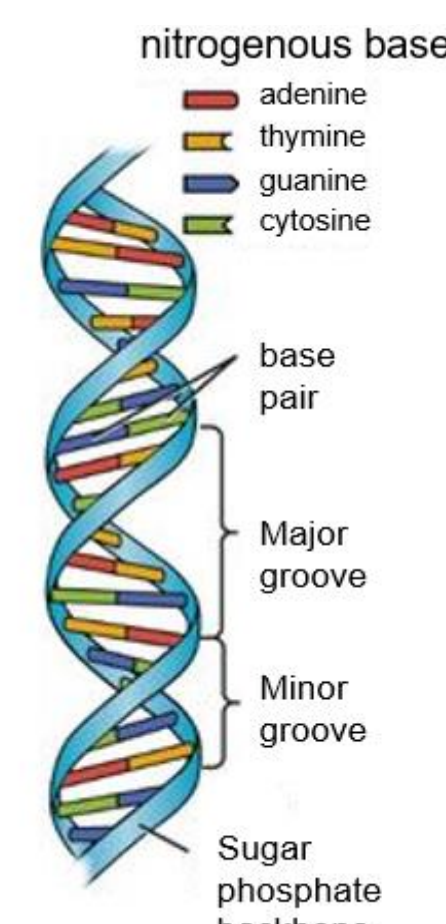
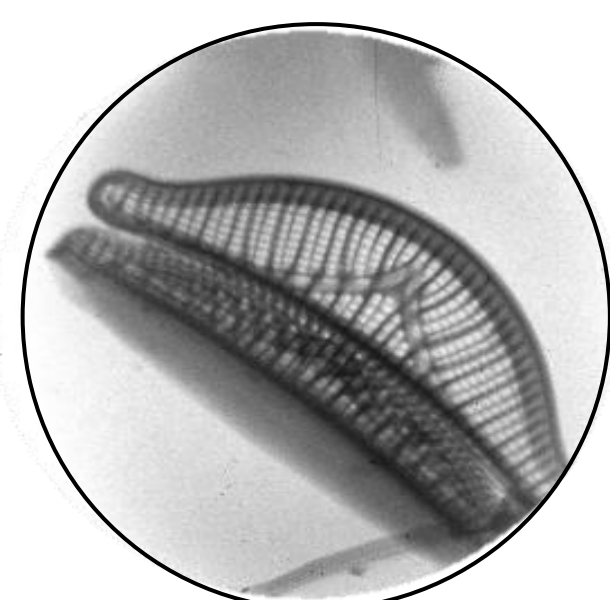
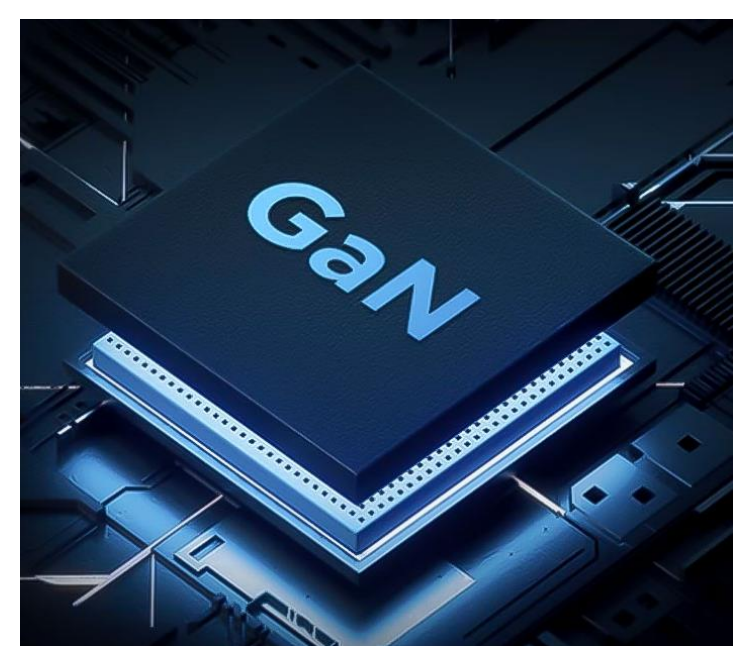
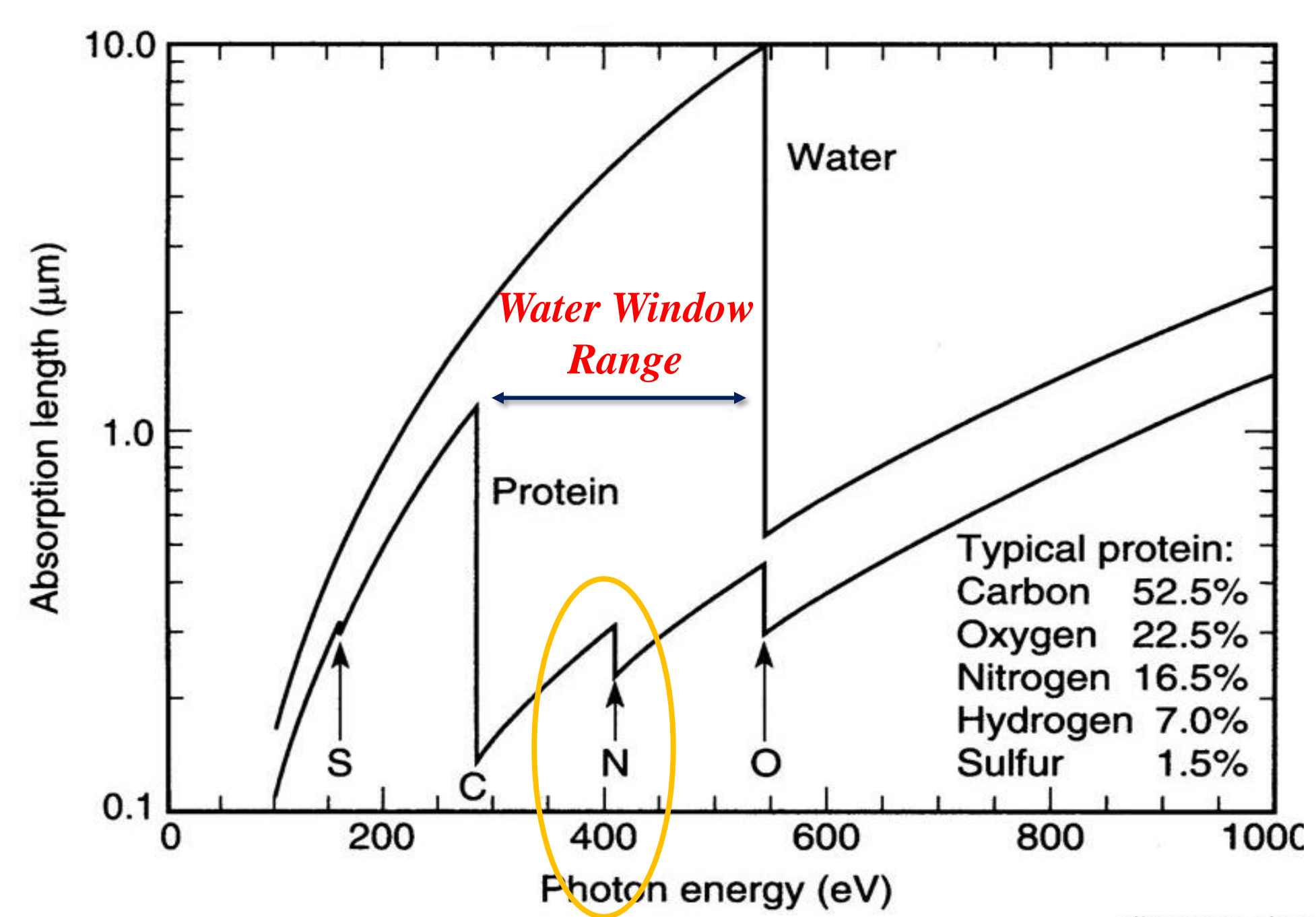
1. Sorbonne Université, Faculté des sciences et Ingénierie, UMR CNRS, Laboratoire de Chimie Physique – Matière et Rayonnement, 4 Place Jussieu, F-75252 Paris Cedex 05, France

2. CEA, LIST, Laboratoire National Henri Becquerel (LNE-LNHB), 91191 Gif-sur-Yvette cedex, France

Motivation

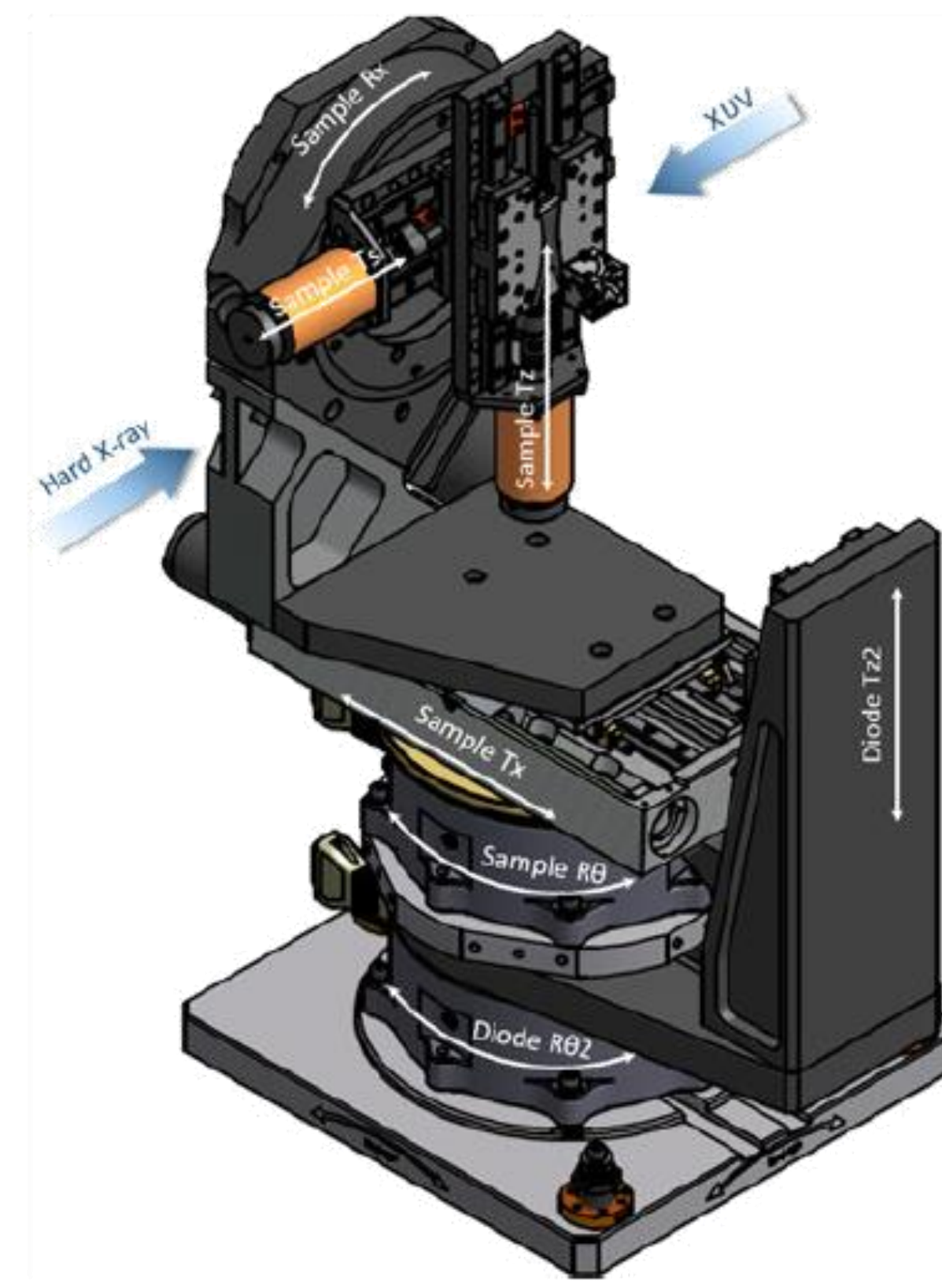
Design of multilayer mirror as optical components for X-ray spectroscopy in the water window range

Water Window Range : C(285 eV) - O (530eV)



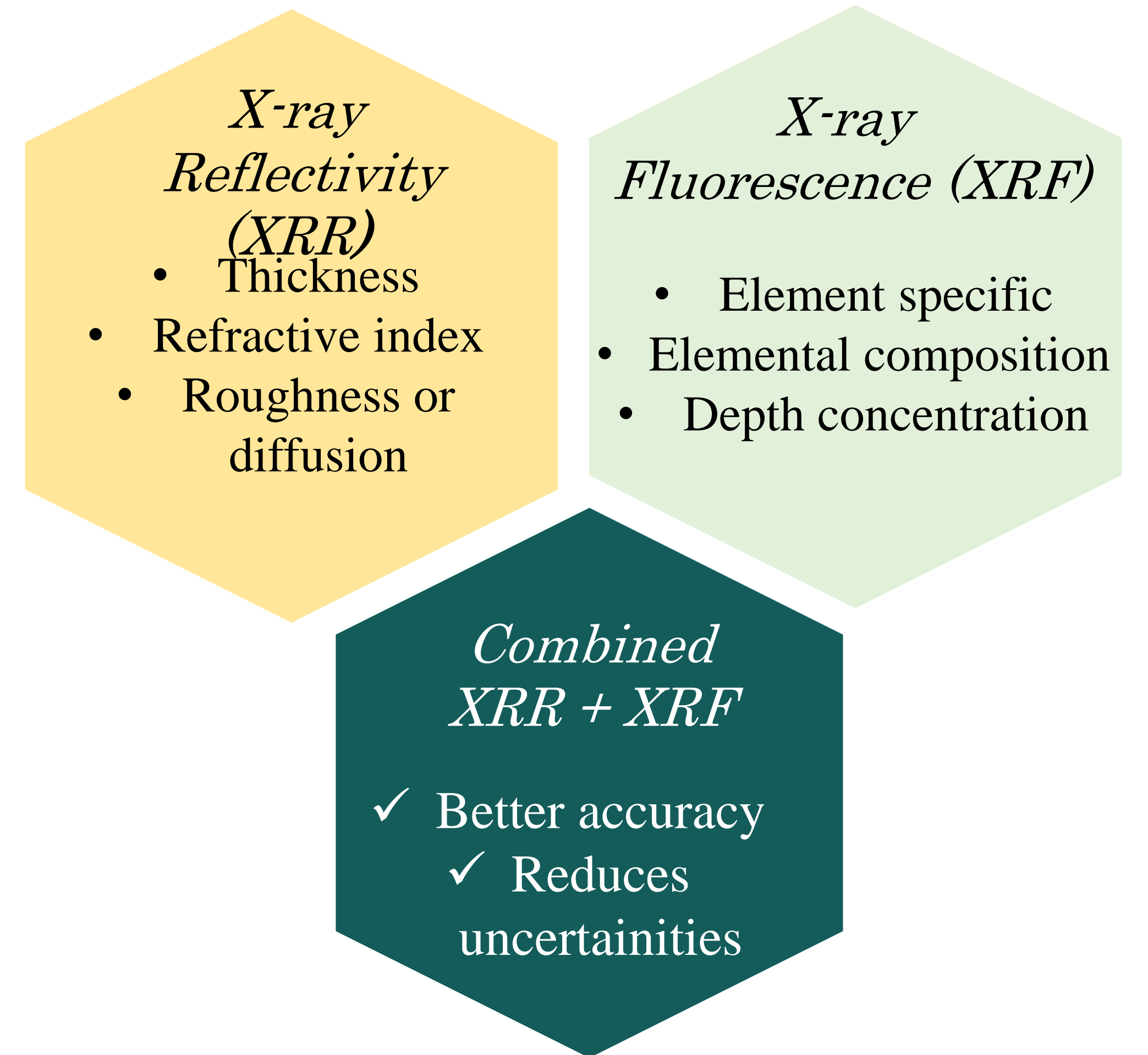
Method of Analysis

CASTOR: Chambre d'Analyse spectrométrique en Transmission ou en Réflexion Metrologie Beamline, SOLEIL

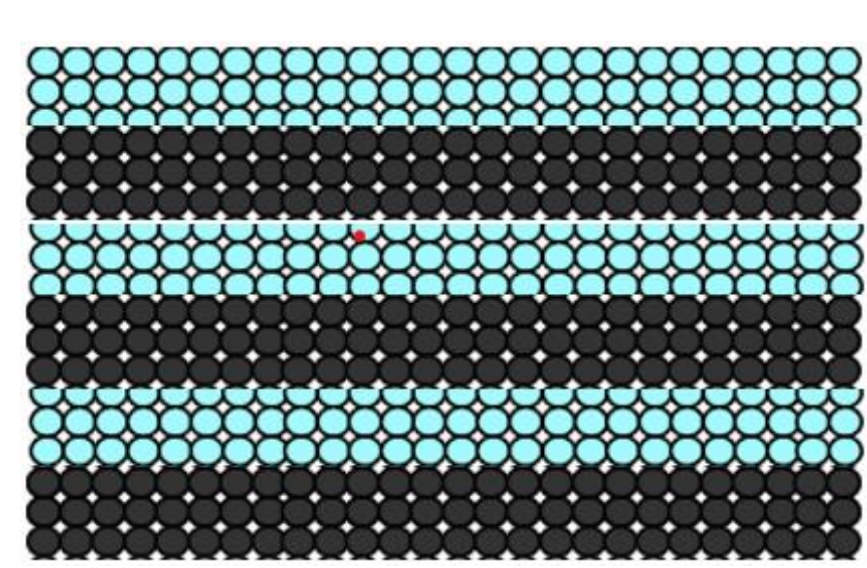


Seven-axis Goniometer

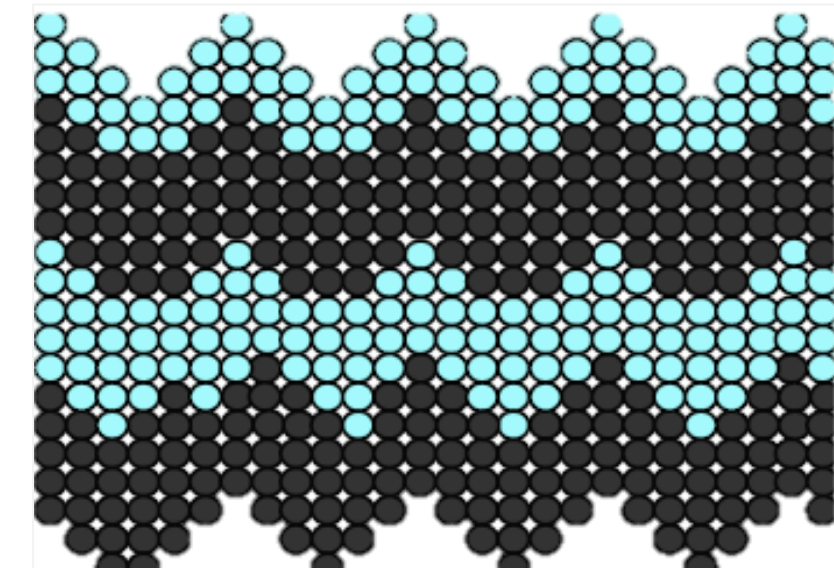
- ❖ Photodiode to record the XRR signal in a θ - 2θ configuration.
- ❖ Silicon drift detector (SDD), placed at 90° with respect to the incoming beam, to acquire the fluorescence one



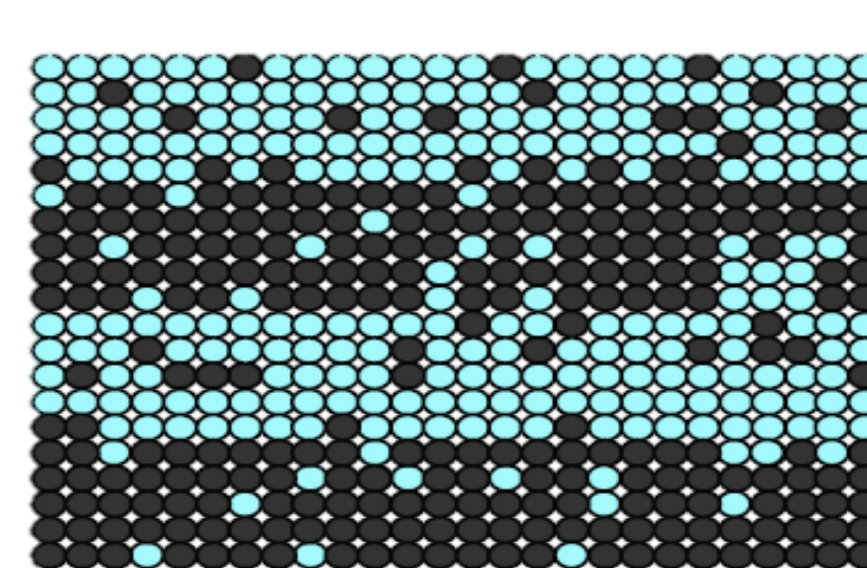
Problem of Interfaces



Perfect Interface



Rough Interface

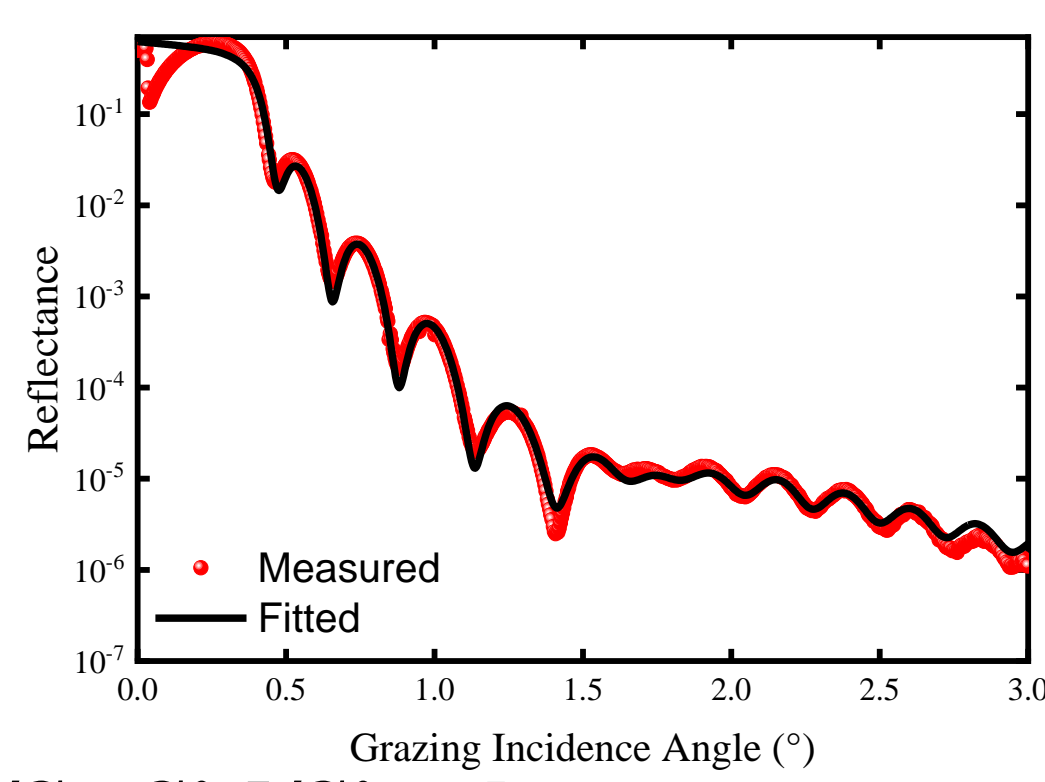


Diffused Interface

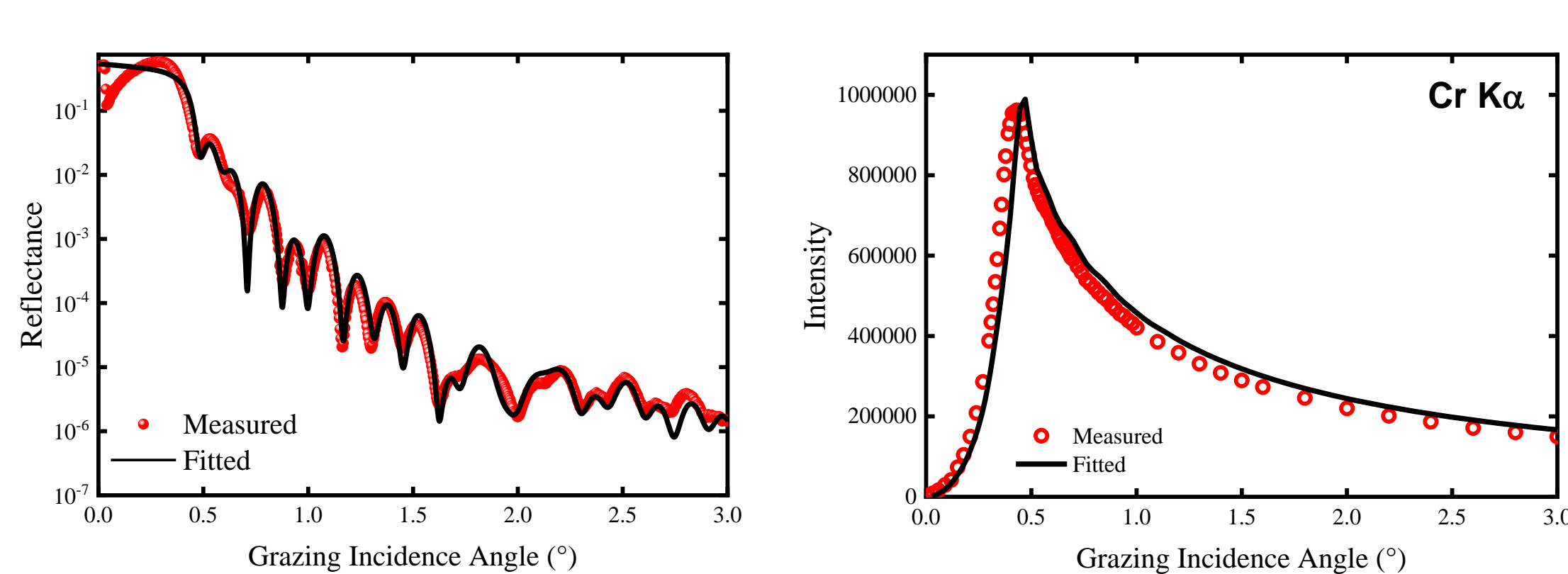
- *Mixing Enthalpy*
- *Method of Fabrication*
- *Stability of interfaces over time*
- *Free surface energy*

Results

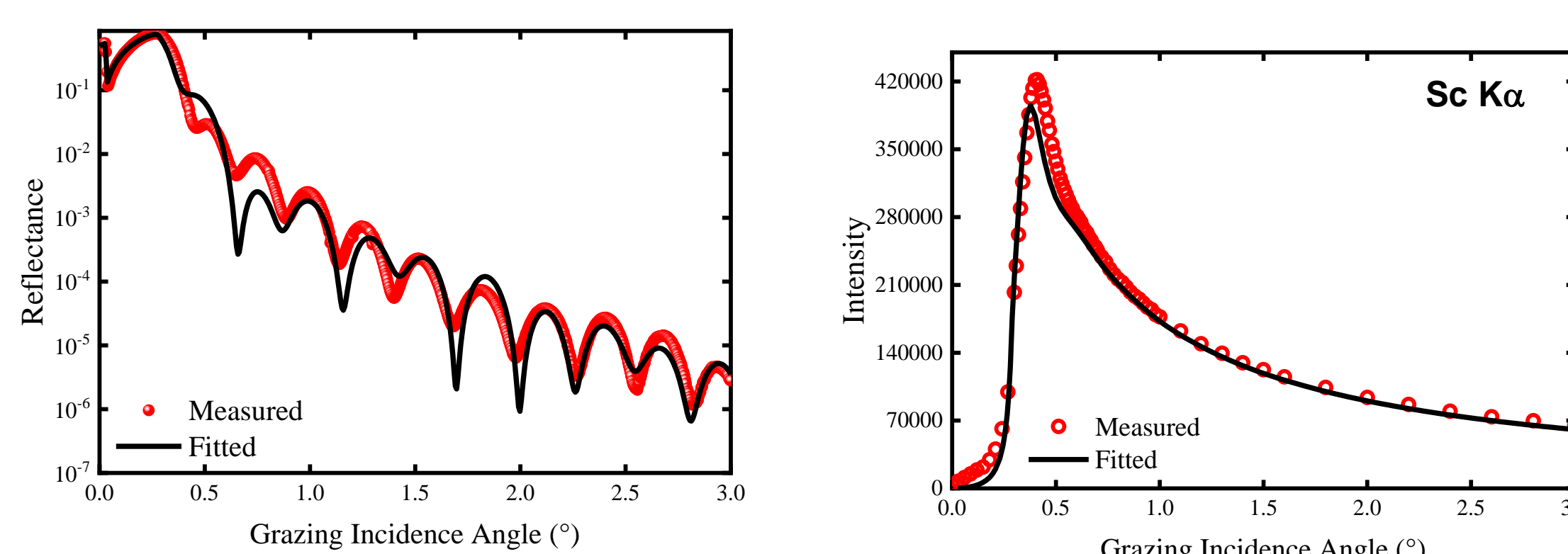
Fitted Structure: $\text{CrO}_3/\text{Cr}_2\text{O}_3/\text{Mg}/\text{MgO}/\text{Si}$ substrate



Fitted Structure: $\text{CrO}_3/\text{Cr}_2\text{O}_3/\text{Sc}/\text{Sc}_x\text{Si}_y/\text{Si}$ substrate



Fitted Structure: $\text{CrO}_3/\text{Cr}_2\text{O}_3/\text{MgO}/\text{MgSc}/\text{Sc}/\text{Sc}_x\text{Si}_y/\text{Si}$ substrate



Conclusion

