

## Microsymposium

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### *Resonant X-ray scattering in low quartz to characterize the polarization light*

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The variation with energy of the diffracted peak intensities around the absorption edges has been known for very long time. It is only very recently that resonant elastic x-ray scattering (REXS) experiments were performed on enantiomers [1], showing the sensitivity of this technique to study tiny features in these materials. In right and left low quartz, azimuthal scans of the (001) reflection intensity show the angular anisotropy by presenting a 3 fold periodicity. These scans are shifted and their amplitude oscillations vary when changing from right to left the enantiomer or when changing the light helicity. Our purpose is to show that azimuthal scans recording the (001) reflection intensity in right and left low quartz can be completely explained by the proper taking into account of the polarization characteristics of the incoming electromagnetic wave. More importantly, we show that such experiments are an excellent way to fully determine the light properties, when this one is not perfectly known. From these scans, we get 3 equations giving their relative shift, the ratio between their amplitude oscillations and the polarization rate. Consequently, without need of simulations because these equations only depend on the symmetry and the geometry, we are able to get the three unknowns which are the Stokes parameter values. Such characterization does not depend on energy, or absorbing atom atomic number. This is thus feasible at other edges or with other compounds, such as GeO<sub>2</sub>, having the same symmetry. This opens the possibility of characterizing the light polarization on a wide energy range. This study is supported by ab initio simulations on REXS and linear dichroism to validate our demonstration and to eliminate the other possibilities such as higher contribution in term of transition channels (E1E2 or E2E2) or birefringence effects.

[1] Y. Tanaka et al., *Phys. Rev. Lett.* 100, 145502 (2008)

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