

# Momentum transfer dependence in X-ray Raman Scattering

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In X-Ray Raman Scattering (XRS), the momentum transfer,  $q$ , plays a role equivalent at first order, to the polarization light in X-ray absorption spectroscopy. It has nevertheless been observed for a long time that when this one increases, differences between these techniques become evident, especially at the rising edges.

Our purpose is to present the mathematical expansion of the field-matter interaction versus the momentum transfer. This one explains the differences and shows the appearance of a monopolar term with its  $\Delta\ell = 0$  selection rule. At most of its well established interest for the low energy edge, this phenomena makes XRS also an interesting probe of electronic states not usually accessible by other absorption spectroscopy techniques. To illustrate this, we will give examples showing the good reproduction, by *ab initio* simulations, of the  $q$ -dependence of spectra recorded at different chemical element edges.