

ID20: non-resonant inelastic X-ray scattering at extreme conditions

Ch.J. Sahle¹

¹ESRF-The European Synchrotron, 71 Av des Martyrs, 38043 Grenoble, France.
sahle@esrf.eu

X-ray Raman scattering (XRS) spectroscopy is an emerging technique to study low energy absorption edges using hard X-rays [1,2]. The use of hard X-rays makes this technique inherently suitable for the study of low-Z-element-containing samples inside e.g. high-pressure diamond anvil cells, especially for disordered and complex materials where diffraction experiments are challenging. ID20 hosts a dedicated state-of-the-art instrument for XRS [3].

Here, we will briefly introduce the XRS technique, present new technical developments [4-6], and show the most recent results obtained of samples under extreme conditions [6-7].

References

- [1] Schülke, Winfried. Electron dynamics by inelastic X-ray scattering. Vol. 7. Oxford University Press, 2007.
- [2] Sahle, Ch. J., A. Mirone, J. Niskanen, J. Inkinen, M. Krisch, and S. Huotari. "Planning, performing and analyzing X-ray Raman scattering experiments." *Journal of synchrotron radiation* 22, no. 2 (2015): 400-409.
- [3] Huotari, S., Ch. J. Sahle, Ch. Henriquet, A. Al-Zein, K. Martel, L. Simonelli, R. Verbeni et al. "A large-solid-angle X-ray Raman scattering spectrometer at ID20 of the European Synchrotron Radiation Facility." *Journal of synchrotron radiation* 24, no. 2 (2017): 521-530.
- [4] Sahle, Christoph Johannes, A. D. Rosa, Matteo Rossi, Valerio Cerantola, Georg Spiekermann, Sylvain Petitgirard, Jeroen Jacobs, Simo Huotari, Marco Moretti Sala, and Alessandro Mirone. "Direct tomography imaging for inelastic X-ray scattering experiments at high pressure." *Journal of synchrotron radiation* 24, no. 1 (2017): 269-275.
- [5] Petitgirard, Sylvain, Georg Spiekermann, Christopher Weis, Christoph Sahle, Christian Sternemann, and Max Wilke. "Miniature diamond anvils for X-ray Raman scattering spectroscopy experiments at high pressure." *Journal of synchrotron radiation* 24, no. 1 (2017): 276-282.
- [6] Weis, Christopher, Christian Sternemann, Valerio Cerantola, Christoph J. Sahle, Georg Spiekermann, Manuel Harder, Yury Forov et al. "Pressure driven spin transition in siderite and magnesiosiderite single crystals." *Scientific reports* 7, no. 1 (2017): 16526.
- [7] Petitgirard, S., C. J. Sahle, C. Weis, K. Gilmore, G. Spiekermann, J. S. Tse, M. Wilke, C. Cavallari, V. Cerantola, and C. Sternemann. "Magma properties at deep Earth's conditions from electronic structure of silica." (2019).