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Sensitive discrimination of multiple species in chemically heterogeneous systems by transition metal 2p3d RXES (Presentation by PSI Thesis Medal Winner)

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Metals, metal oxides (as well as sulfides, carbides, etcetera) and metal complexes play a big role in nanotechnology and catalysis. In most reactions that make use of a metal catalyst, many different chemical forms of the metal entity exist and it is often unclear what the active site is that performs the catalytic conversion of reactants. In my thesis-work[1-5] I did not try to identify such active sites of a given catalyst, since I believe this would have been close to unfeasible at present. Rather, I demonstrated that 2p3d2p resonant X-ray emission spectroscopy (RXES), or resonant inelastic X-ray scattering (RIXS), is capable of discriminating more chemical species out of a heterogeneous mixture of compounds than 2p X-ray absorption spectroscopy (XAS) or, for example, lab-based ultraviolet-visible (UV/Vis) spectroscopy. All work was deliberately performed on cobalt compounds, since it is a relatively abundant and cheap transition metal and a general consensus exists that society should shift towards catalysis based on such abundant metals. Moreover, since the final state of a 2p3d2p experiment is close to the system ground state (the final state has a 3d hole) one measures essentially the valence electronic states that are important in chemistry i.e. states that occur a few electron volt above the highest occupied state. This work thus exhibits some of the rich information that metal 2p3d2p RXES contains about complex and relevant transition metal systems.

All data were obtained at the ADRESS beamline of the Swiss Light Source (SLS).

References:
[1] M.M. van Schooneveld, 2p3d resonant X-ray emission spectroscopy of cobalt compounds, 2013.
[2] M.M. van Schooneveld, R.W. Gosselink, T.M. Eggenhuisen, M. Al Samarai, C. Monney, K.J. Zhou, T. Schmitt, F.M.F. de Groot, Angewandte Chemie Int. Ed. 2013, 52, 1170.
[3] M.M. van Schooneveld, R. Kurian, A. Juhin, K. Zhou, J. Schlappa, V.N. Strocov, T. Schmitt, F.M.F. de Groot, Journal of Physical Chemistry C 2012, 116, 15218-15230.
[4] M.M. van Schooneveld, E. Suljoti, C. Campos-Cuerva, R.W. Gosselink, A.M.J. van der Eerden, J. Schlappa, K.J. Zhou, C. Monney, T. Schmitt, F.M.F. de Groot, Journal of Physical Chemistry Letters 2013, 4, 1161.
[5] M.M. van Schooneveld, A. Juhin, C. Campos-Cuerva, T. Schmitt, F.M.F. de Groot, Jounral of Physical Chemistry C 2013, 117, 14398.

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