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Soft x-ray absorption and scattering studies of quantum materials

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Soft x-ray absorption and scattering at transition metal L2,3 edges has been an extremely prolific method for researchers over the past several decades. Our understanding of the multiplet-dominated lineshapes allows for detailed analyses of oxidation states and charge transfer effects, magnetism, and electronic effects of local site symmetry, for example. However, strongly covalent compounds with high oxidation states have always posed a problem for conventional models. I will present our recent work in developing more sophisticated approaches to tackle these difficult cases. I will focus on applications within correlated 3d transition metal oxides, including bulk materials and thin film heterostructures, and synchrotron techniques including absorption, scattering, and reflectivity. This improved modelling is relevant for fields including quantum materials, oxides for battery electrodes, metal-insulator transition materials, and more.

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