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Pressure dependence of the crystal and electronic structure of iridium fluorides studied by XRPD and RIXS

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In the last decade, iridium oxides (iridates) have been heavily studied due to their unexpected cor- related behavior induced by the strong spin-orbit coupling (SOC) and crystal field. Their novel ground state arises from the superposition of the Ir outermost orbitals and is often referred to as jeff =1/2 state. Recently, Birol and Haule[1] predicted the realization of similar spin-orbit induced correlated physics in another class of materials namely iridium fluorides. Recent work by Pedersen et al.[2] and Rossi et al.[3] seem to validate this theoretical study by means of x-ray magnetic circular dichroism (XMCD) and resonant inelastic x-ray scattering (RIXS), respectively.
The main goal of this thesis is to study the pressure dependence of the electronic ground state of iridium fluorides and its relation with SOC and trigonal distortion which are the two main parameters governing the ground state. The pressure dependence of the electronic states of these compounds was mapped by RIXS measurements, which were performed at beamline ID20 of the European Synchrotron Radiation Facility (ESRF, Grenoble). From these measurements we observe an increasing splitting of the jef f =3/2 excited states, and a shift of the center of mass of these levels. X-ray powder diffraction (XRPD) measurements will later be performed at beamline ID27 of the ESRF to obtain the corresponding pressure dependence of the crystal structure.

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