Unconventional magnetism in honeycomb cobaltates

This is a joint program between the Institut Laue-Langevin (ILL) and Université Grenoble Alpes (UGA) – Institut Néel. The project combines laboratory characterization techniques with neutron scattering experiment to study the interplay between the structural and magnetic properties of new cobaltate honeycomb-lattice compounds.

Honeycomb cobaltate materials are an interesting platform to explore unconventional magnetism. Indeed, the cobalt ions usually host a sizeable spin-orbit coupling, of the same order of magnitude as the magnetic interactions. Therefore, the interplay between magnetism and the lattice degree of freedom is expected to be strong. In the context of the recent Kitaev model, we have recently revisited a family of compounds, $BaCo_2(XO_4)_2$ (X = As, P), in which magnetic cobalt ions form well separated honeycomb layers. We propose in this PhD project to disturb the hierarchy of interactions in this family of compounds in order to unveil possible underlying exotic magnetic states. For this we will use chemical substitution on the interlayer anions and on the cobalt sites, as well as external pressure. A comprehensive structural study will be carried out using neutron diffraction in order to further understand the interplay between the magnetic properties and the lattice in these compounds. Such interplay will be rationalized by studying the magnetic excitations using neutron inelastic scattering.

This project will combine laboratory characterization techniques (X-ray diffraction, magnetometry…) and neutron scattering measurements, using the resources from both the Institut Laue-Langevin (ILL) and Institut Néel. This will be facilitated by the close geographical location of both Institutes. The student will thus have the opportunity to strongly interact with the MagSup team at Institut Néel and instrument scientists at the ILL.

We are looking for a highly motivated candidate with a strong background in condensed matter physics, with a strong interest for experimental work. Applications should include a grade transcript, a CV and a motivation letter. The successful applicant will be registered at the Grenoble UGA doctoral school.

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