



IFMP Seminar

Date Monday, April 14, 2025, at 14:50

REC/C213

Zoom: 688 4227 2214, Passcode: IFMP2024-5

Speaker **Steven Gebel**

IFMP, TU Dresden

Title **X-ray diffraction and spectroscopy studies under high pressure to clarify possible quantum spin-liquid states in $\text{Na}_3\text{Co}_2\text{SbO}_6$**

Abstract Honeycomb cobaltates with Co^{2+} ($3d^7$) ions have been proposed as materials which can host Kitaev quantum spin-liquid (QSL) states. Specifically, $\text{Na}_3\text{Co}_2\text{SbO}_6$ has been predicted to exhibit a Kitaev QSL upon reduction of the trigonal ligand- and crystal-field splitting, which in turn might be possible *via* the elastic tuning of the lattice structure [1,2]. This compound hosts edge-sharing CoO_6 octahedra and exhibits antiferromagnetic zig-zag ordering below 8 K [3]. In this talk, I present a combination of x-ray diffraction (XRD) and spectroscopy (NIXS) in diamond anvil cells to explore the effect of hydrostatic pressure on the lattice and electronic structure of $\text{Na}_3\text{Co}_2\text{SbO}_6$. While XRD reveals the pressure dependence of the lattice structure, the high-pressure Co L edge dependence is probed by NIXS, yielding information about the pressure dependent configuration of the Co $3d$ shell. I present crystal structure data up to 17 GPa of the $C2/m$ monoclinic structure. The NIXS results show significant changes of the Co L -edge line shape for hydrostatic pressures up to 5 GPa. This sets the basis for upcoming theoretical modeling with multiplet and density-functional calculations.

[1] Liu, Huimei, *et al.*, Phys. Rev. Lett. **15**, 047201 (2020).

[2] Liu, Huimei, *et al.*, Phys. Rev. B **97**, 014407 (2018).

[3] Yan, J.-Q., *et al.*, Phys. Rev. Mater. **3**, 074405 (2019).

Host: J. Geck