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High-pressure phases of Kitaev materials (as seen by muSR)

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Bond-dependent interactions between magnetic moments can lead to strong frustration and nontrivial ground states. In particular, the Kitaev-Heisenberg model has a rich phase diagram and can host a spin liquid state or different frozen states depending on the strength of the additional Heisenberg interactions. Experimentally, such phase diagrams can be explored by modifying the relative interaction strengths in materials by applying pressure.

In this presentation, I will describe how the muon spin rotation technique can be used to study such materials under applied pressure and what it can reveal about the transitions between different phases. I will then show examples of our recent high-pressure studies in Kitaev candidate materials. In Na2IrO3 the magnetic order is enhanced by the application of pressure up to at least 4 GPa. Combined with structural studies, we can explain this as a compression of the honeycomb layers [1]. In beta-Li2IrO3, we find that the magnetically ordered state collapses at 1.4 GPa [2], originating from dimerization of the Ir ions. In alpha-RuCl3, a similar phase transition is also observed at about 0.4 GPa [3], which is concomitant with unconventional response in the muon polarization function.

I will summarize the emerging generic picture of Kitaev materials under pressure and will discuss the peculiarities of the muon response in these systems.

[1] G. Simutis et al., PRB **98**, 104421 (2018)
[2] M. Majumder et al., PRL **120**, 237202 (2018)
[3] G. Simutis et al., in preparation

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