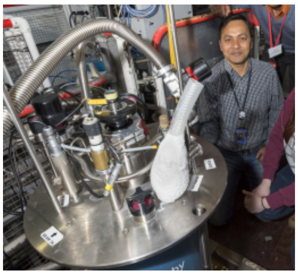

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Quantum spin liquids on triangular spin lattices

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Magnetic materials usually undergo magnetic ordering at low temperatures, however, in certain instances they may remain quantum disordered even at zero temperature. Such a case is found in a quantum spin liquid (QSL), a state that is highly entangled, yet it lacks magnetic ordering. QSL states have been experimentally suggested for a variety of geometrically frustrated materials, including those featuring two-dimensional triangular spin lattice. For this lattice, however the simplest isotropic Heisenberg exchange leads to magnetic ordering, therefore, perturbations to the isotropic model are required to stabilize a QSL.
In my talk, I will focus on our recent discovery of a novel QSL candidate with perfect triangular symmetry neodymium heptatantalate, NdTa7O19, in which magnetic anisotropy is extremely large [1]. In-depth experimental studies including muon spin relaxation, neutron scattering, and electron spin resonance all suggested lack of magnetic ordering even at temperatures of only a few tens of millikelvins, much below the exchange-interaction scale of this compound. Furthermore, sizable Ising-like spin correlations between the nearest neighbors on the triangular lattice and persistent spin dynamics were found in the ground state. Recently, progress has been made also in theoretical understanding of this intriguing magnetic ground state of neodymium heptatantalate, which critically depends on small transverse magnetic exchange in addition to the dominant Ising exchange [2]. As the magnetic anisotropy of rare earths can greatly change from one ion to another, rare-earth heptatantalates provide a new generic framework for QSLs and other intriguing quantum states. Parallels will be drawn to some other promising members of the family.

References

[1] T. Arh, B. Sana, M. Pregelj, P. Khuntia, Z. Jagličić, M. D. Le, P. K. Biswas, P. Manuel, L. Mangin-Thro, A. Ozarowski, and A. ZorkoThe Ising triangular-lattice antiferromagnet neodymium heptatantalate as a quantum spin liquid candidate, Nat. Mater. 21, 416 (2022).
[2] M. Ulaga, J. Kokalj, A. Zorko, and P. Prelovšek, Quantum spin liquid in the easy-axis Heisenberg model on frustrated lattices, arXiv:2307.03545.

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