Poster-2-4

Magnetic excitation of the near-ideal molecule-based Haldane spin chain Ni2(3,5-lut)4 in a magnetic field

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Quantum magnets are a special class of magnetic materials in which long-range magnetic order is suppressed or destroyed by strong quantum spin fluctuations, which become increasingly relevant towards zero temperature. Study of such systems is at the forefront of condensed matter physics. Among these materials, spin-1 Heisenberg antiferromagnetic (AFM) chains, known as Haldane chains, are of special interest due to their novel magnetic properties [1,2,3]. Recently, interest in predicting and controlling the magnetic ground state of $S = 1$ quantum magnets has been fueled by the realization of multiple magnetic phases in a series of organic compounds. One dimensional spin-1 AFM chain $NiI_2(3,5\text{-lut})_4$, where 3,5-lutidine (C_7H_9N), has emerged as a significant molecular system for studying low-dimensional quantum magnetism, due to its near-ideal realization of isotropic Haldane spin chain [4]. Among Haldane systems with comparable degrees of anisotropy, including Y_2BaNiO_5, $PbNi_2V_2O_8$, and $SrNi_2V_2O_8$, $NiI_2(3,5\text{-lut})_4$ has the lowest energy scale and is therefore a uniquely ideal Haldane system that provides easy access to the entire Haldane phase for field-tuning through the quantum critical region associated with the closure of their Haldane gaps using dc magnetic fields.

[1] F. H. L Essler and I. Affleck. Haldane-gap chains in a magnetic field. Journal of Statistical Mechanics: Theory and Experiment, 2004(12):P12006, Dec 2004.

[2] A. K. Bera, B. Lake, A. T. M. N. Islam, B. Klemke, E. Faulhaber, and J. M. Law. Field-induced magnetic ordering and single-ion anisotropy in the quasi-one-dimensional haldane chain compound srni2v2o8: A single-crystal investigation. Phys. Rev. B, 87:224423, Jun 2013.

[3] A. K. Bera, B. Lake, A. T. M. N. Islam, and A. Schneidewind. Critical properties of coupled anisotropic haldane spin chains in a magnetic field. Phys. Rev. B, 92:060412, Aug 2015.

[4] R. C. W., W. J. A. Blackmore, S. P. M. Curley, M. R. Lees, S. M. Birnbaum, J. Singleton, B. M. Huddart, T. J. Hicken, T. Lancaster, S. J. Blundell, F. Xiao, A. Ozarowski, F. L. Pratt, D. J. Voneshen, Z. Guguchia, C. Baines, J. A. Schlueter, D. Y. Villa, J. L. Manson, and P. A. Goddard. Near-ideal molecule-based haldane spin chain. Phys. Rev. Res., 2:013082, Jan 2020.