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Molecular-based 2D S = 1/2 Heisenberg Antiferromagnetic Layers and Ladders

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Low dimensional Quantum Heisenberg Antiferromagnets (QHAF) have long provided materials [1] with which to examine the influence of dimensionality and exchange anisotropy on critical behavior of cooperative systems. Molecular-based QHAF have provided materials with low exchange strengths (≈ 10 K), facilitating examination of the compounds up to the saturation fields using current facilities. This presentation will provide an overview of recent developments of two classes of molecular magnets: 2D QHAF and spin ladders. Recent specific heat studies of $Cu(pz)_2(ClO_4)_2$ in fields up to 45 tesla have determined the (H,T) phase diagram for this quasi-2D QHAF; the results will be compared to the results of QMC simulations of the diagram as a function of the intralayer exchange J, the interlayer exchange J', and the XY-exchange anisotropy parameter. Developments in the study of spin ladders include the discovery of Luttinger liquid behavior for two molecular-based spin layers: the strong-rung ladder BPCB, (piperidinium)$_2$CuBr$_4$ [2] and the strong-rail ladder DIMPY, (2,3-dimethypyridinium)$_2$CuBr$_4$ [3]. The properties of a new, isotropic spin ladder will be reported.

[1] L. J. de Jongh and A. R. Miedema, Adv. Phys. **50**, 947 (2001).
[2] M. Klanjšek *et al*, Phys. Rev. Lett. **101**, 137207 (2008); Ch. Rüegg *et al*, Phys. Rev. Lett. **101**, 247207 (2008).
[3] K. Ninios *et al*, Phys. Rev. Lett. **108**, 097201 (2012); D. Schmidiger *et al*, Phys. Rev. Lett. **108**, 167201 (2012).