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The structure-magnetism relationship in a molecule-based magnetic system: magnetic order and quantum disorder in one and zero dimensions TOM LANCASTER, Durham University, UK, STEPHEN BLUNDELL, JOHANNES MÖLLER, SAMAN GHANNADZADEH, University of Oxford, UK, PAUL GODDARD, University of Warwick, UK, PETER BAKER, FRANCIS PRATT, ISIS Facility, UK, JAMIE MANSON, Eastern Washington University, USA
— We have synthesized two distinct molecule-based magnets from the same starting components. These show different structural motifs which promote contrasting exchange pathways and consequently lead to markedly different magnetic ground states. Through examination of their structural and magnetic properties we show that $[Cu(pyz)(H_2O)(gly)_2](ClO_4)_2$ may be considered a quasi one-dimensional quantum Heisenberg antiferromagnet while the related compound $[Cu(pyz)(gly)](ClO_4)$, which is formed from strongly antiferromagnetically interacting Cu^{2+} dimers, remains disordered down to at least 0.03 K in zero field, but shows a field-temperature phase diagram reminiscent of that seen in materials showing a Bose-Einstein condensation of magnons. We emphasise the use of muon-spin relaxation as a probe of these materials, which has allowed us to determine magnetic ordering that is invisible to many conventional measurement techniques. This is especially useful in low-dimensional magnetism where strong thermal and quantum fluctuations often make transitions to states of long-range magnetic order difficult to observe.

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