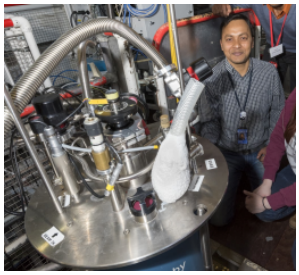

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Charge Order Stabilized Quantum Spin Liquid realised in Hollandite K2V8O16

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Low dimensional magnetism is a field that has developed tremendously over the last decades. In search for model compounds, the use of high-pressure synthesis is an effective route for stabilizing otherwise inaccessible crystal structures and materials. Among such compounds we find K2V8O16, which is a quasi 1D magnet that belongs to the Hollandite family. K2V8O16 undergoes TMIT = 160 K, driven by a charge order (CO) formation, which is also visible in the bulk magnetic susceptibility that display a ~ 50 % reduction at TMIT = 160 K. Single crystal X-ray diffraction (XRD) explains the sudden decrease due to a dimerization in half of the V chains and the formation of spin singlets. Consequently, the remaining 50 % of the chains can be considered as isolated spin−1/2 chains, sustained within a 'sea' of spin-dimerized chains. Muon spin relaxation measurement confirm that this CO stabilised isolated spins chains do not order down to lowest measured temperature of 100 mK. The longitudinal field dependence of the longitudinal field relaxation rate suggest that the ground state is a Tomonaga-Luttinger liquid. Additional hydrostatic and chemical pressure studies confirm the onset of highly fluctuating AF and short-range FM orders, in line with the predicted phase diagram of XXZ-Hamiltonian. Ambient and pressure dependent studies support a scenario in which the ground state at ambient pressure of K2V8O16 is a TLL, which here uniquely stabilised due to a peculiar form of CO.

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