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Absence of long range order in $SrDy_2O_4$ frustrated magnet due to trapped defects from a dimensionality crossover NICOLAS GAUTHIER, AMY FENNELL, ANNE-CHRISTINE ULDRY, BERNARD DELLEY, ROMAIN SIBILLE, JONATHAN WHITE, CHRISTOF NIEDERMAYER, VLADIMIR POMJAKUSHIN, MICHEL KENZELMANN, Paul Scherrer Institut, BOBBY PREVOST, ALEXANDRE DESILETS-BENOIT, ANDREA D. BIANCHI, Universite de Montreal, HANNA A. DABKOWSKA, Brockhouse Institute for Materials Research, GORAN NILSEN, LOUIS-PIERRE REGNAULT, Institut Laue-Langevin
— The simultaneous occurence of geometrical frustration and low dimensionality can lead to strongly correlated fluctuating ground states. In the $SrLn_2O_4$ compounds, the Ln magnetic ions form one-dimensional (1D) zig-zag chains that have both of these characteristics, offering a playground to study novel states of matter. In $SrDy_2O_4$, the two inequivalent Dy^{3+} sites are Ising-like with perpendicular easy-axes, favouring the decoupling of neighbouring zig-zag chains. No long range order is observed down to $T = 60$ mK in zero field but diffuse neutron scattering indicates short range correlations that are consistent with those of the 1D Ising zig-zag chain model. AC susceptibility measurements indicate a slowing down of the fluctuations at low temperatures. We attribute this behaviour to the domain walls in the zig-zag chains. Experimental evidence of a dimensionality crossover at low temperatures in $SrDy_2O_4$ suggest that the domains walls are trapped because of interchain interactions, precluding long-range order to the lowest temperatures.

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