Quasi-one-dimensional S=1/2 magnet $Pb[Cu(SO_4)(OH)_2]$: frustration due to competing inchain exchange

M. Baran[a], A. Jędrzejczak[a], H. Szymczak[a], V. Maltsev[b], G. Kamieniarz[c], G. Szukowski[c], C. Loison[d], A. Ormeci[d], S.-L. Drechsler[e] and H. Rosner[d]

[a]Institute of Physics, Polish Academy of Sciences, 02-668 Warsaw, Poland
[b]Department of Geology, Moscow State University, 119899 Moscow, Russia
[c]Institute of Physics, A. Mickiewicz University, 61-614 Poznań, Poland
[d]Max-Planck-Institut für Chemische Physik fester Stoffe, 01187 Dresden, Germany
[e]Institut für Festkörpertheorie im IFW Dresden, 01171 Dresden, Germany

9.7 cm

Zero-field susceptibility and specific heat of $Pb[Cu(SO_4)(OH)_2]$ single crystal were studied. Magnetic measurements were performed using a commercial SQUID magnetometer in the temperature range 2-300 K and the temperature dependence of magnetic susceptibility were found along the symmetry axes. Heat capacity measurements were carried out for $T < 20$ K, using the adiabatic heat pulse method, showing a sharp anomaly at $T = 2.8$ K. In order to verify that linarite is a quasi-one-dimensional system with competing nearest-neighbour and next-nearest-neighbour inchain exchange interaction, theoretical results based on electronic structure calculations within the LDA and a phenomenological analysis using the finite-temperature transfer-matrix method are presented. Depending on the value of the screened onsite repulsion $U \approx 3$ to 5 eV the possibility of a variety of ground states is discussed: ordinary commensurate Néel or spin-Peierls phases versus incommensurate spiral states with acute or obtuse pitch angles. We compare linearite with other related edge-shared cuprate chain materials.

13.4 cm

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Corresponding author :
G. Kamieniarz

Address for correspondence :
Institute of Physics
A. Mickiewicz University
ul. Umultowska 85, 61-614 Poznań, Poland

Email address :
gjk@amu.edu.pl