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ABSTRACT:

Quantum Coherence in a Spin-Peierls-Like System (Et-2,6-diMe-Pz)(TCNQ)2

E. Čižmár[1], M. Holub[2], D. Šoltésová[1], V. Tkáč[1], P. Doležal[3], D. Kriegner[3,4], V. Eigner[4], M. Dušek[4], D. Ziolkovskiy[5], J. van Tol[6], M.W. Meisel[1,7], A. Feher[1]

[1]Institute of Physics, P.J. Šafarik University, Košice, Slovakia

[2]Faculty of Physics and Applied Computer Science, AGH University of Krakow, Krakow, Poland

[3]Department of Condensed Matter Physics, Faculty of Mathematics and Physics, Charles University, Prague, Czech Rep.

[4]Institute of Physics of the Academy of Sciences of the Czech Rep., Prague, Czech Rep.

[5]Department of Chemistry, V.N. Karazin Kharkiv National University, Kharkiv, Ukraine

[6]NHMFL, Florida State University, Tallahassee, FL, USA

[7]Department of Physics and NHMFL, University of Florida, Gainesville, FL, USA

The intriguing structural and magnetic properties of chain-like anion-radical salt (Et-2,6-diMe-Pz)[TCNQ]2, where Et-2,6-diMe-Pz is N-ethyl-2,6-dimethylpyrazinium and TCNQ is 7,7,8,8-tetracyanoquinodimethane, are reported. The nature of the low-temperature transition near 164 K, which may be misidentified as a traditional spin-Peierls event, is clarified with X-ray diffraction, magnetometry, and numerical calculations. A spin-Peierls-like transition due to a subtle intrinsic magnetic dimerization present at room temperature was observed. The dimerisation of the antiferromagnetic spin chains in (Et-2,6-diMe-Pz)[TCNQ]2 predicted by DFT calculations is much stronger in the low-temperature phase ($\alpha = 0.087$) than in the high-temperature phase ($\alpha = 0.628$), as observed in the magnetic properties. EPR experiments in the low-temperature phase revealed evidence of $S = 1/2$ moments identified as pinned solitons. which can serve as quantum bits with a long coherence time. Pulsed EPR experiments showed that quantum coherence is strongly affected by the dimerization ratio as compared to previously reported pinned soliton systems [1].

[1] S. Bertaina et al., Phys. Rev. B, 90, 060404(R) (2014).

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