

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

ESR study of the (super)conducting charge-transfer salts β'' - $(\text{ET})_4[(\text{H}_3\text{O})\text{M}(\text{C}_2\text{O}_4)_3]S$ ALESSANDRO NARDUZZO, AMALIA COLDEA, University of Bristol, ARZHANG ARDAVAN, University of Oxford, JOHN SINGLETON, LANL, Los Alamos, VASILE BERCU, LUCA PARDI, IPCF, Pisa, AKANE AKUTSU-SATO, HIROKI AKUTSU, SCOTT TURNER, PETER DAY, Royal Institution, London — We present a spin resonance investigation of the family of quasi- two-dimensional organic (super)conductors β'' - $(\text{ET})_4[(\text{H}_3\text{O})\text{M}(\text{C}_2\text{O}_4)_3]S$ ($\text{M} = \text{Cr}^{3+}, \text{Fe}^{3+}$; S is a guest molecule). The spin systems are probed by means of both resonant cavity perturbation and field modulation techniques in the frequency range 50-313 GHz. The role of the different solvent molecules in determining the degree of spin-orbit coupling and the local symmetry at the metal ion site is established. Intensities, positions and widths of the resonant lines reveal significant modifications of the spin-orbit coupling, and of the inter- and intra-ionic spin-spin interactions below $T = 10\text{K}$. Despite the onset of a weak antiferromagnetic internal field at low temperature, the ultimate narrowing of the lines suggests spin-lattice interactions are still the dominant relaxation process. Additional lineshifts observed below $B = 2.5\text{ T}$ and $T = 4\text{ K}$, attributed to the presence of diamagnetic currents in the mixed state of the superconducting samples, provide a threshold for full field penetration within the “insulating” anion layers.

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Date submitted: 06 Dec 2006

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