

Ethylene groups ordering transition in the β'' -(BEDT-TTF)₄[(H₃O)Fe(C₂O₄)₃] \cdot Y magnetic molecular conductors

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Superconductivity in two-dimensional radical cation salts and its interplay with electron-electron correlations are continuing to attract considerable attention. The polarized infrared reflectance and Raman spectra of quasi-two-dimensional β'' -(BEDT-TTF)₄[(H₃O)Fe(C₂O₄)₃] \cdot Y charge-transfer salts where Y=C₆H₅Br, (C₆H₅CN)_{0.17}(C₆H₅Br)_{0.83}, (C₆H₅CN)_{0.4}(C₆H₅F)_{0.6}, have been measured as a function of temperature. Signatures of charge inhomogeneity have been found in both Raman and infrared spectra. The 100 K transition to a mixed insulating/metallic state is clearly seen in the temperature dependence of the electronic spectra of superconducting β'' -(BEDT-TTF)₄[(H₃O)Fe(C₂O₄)₃] \cdot C₆H₅Br. We suggest that the phase transition is due to subtle change in ethylene groups ordering related with the structural phase transition in the anionic layer.