Spectroscopic studies of the phase transition from the Mott insulator state to the charge ordering state of \( \kappa-(ET)_4[M(CN)_6][N(C_2H_5)_4]\cdot 2H_2O \) (\( M = Co^{III} \) and \( Fe^{III} \)) salts

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We report detailed IR investigations of the charge ordering (CO) transition at \( T=150 \) K and charge fluctuations in \( \kappa-(ET)_4[M(CN)_6][N(C_2H_5)_4]\cdot 2H_2O \) (\( M = Co^{III} \) and \( Fe^{III} \)). As a consequence of the CO, electronic and vibrational spectra are modified. The most important proof of the CO is the appearance of the electronic band at \( 7000 \) cm\(^{-1}\) attributed to charge transfer in \( (ET)_2^{2+} \) dimers and also the vibrational band at \( 1347 \) cm\(^{-1}\) being the result of coupling of C=C mode of ET with this electronic excitation. Apart from the long-range Coulomb interactions between electrons also the anions can have a significant influence on the formation of the CO state.

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