Spectroscopic studies of the phase transition from the Mott insulator state to the charge ordering state of κ-$(ET)_4[M(CN)_6][N(C_2H_5)_4]\cdot 2H_2O$ (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 κ-$(ET)_4[M(CN)_6][N(C_2H_5)_4]\cdot 2H_2O$ (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.

This work was supported by the National Science Centre (Decision No. DEC-2012/04/M/ST3/00774).