IR absorption by free carriers in nanostructured organic crystals
of tetrathiotetracene-iodide

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The coefficient of long wave infra red (IR) absorption α is calculated for nanostructured organic crystals of tetrathiotetracene-iodide, TTT_2I_3, at room temperature as a function of radiation frequency ν in the interval from 10^{12} Hz to 10^{13} Hz. In this interval the lattice absorption is still weak. Two the most important interaction mechanisms of carriers with longitudinal acoustic phonons are considered. One is of deformation potential type, and the second is similar to that of polaron. The carriers scattering on impurities is described by the dimensionless parameter D which is proportional to impurity concentration. Calculations are made for crystals with different values of D and different values of the dimensionless parameter γ which is the ratio of amplitudes of both electron-phonon interactions. In not very pure crystals, α slowly decreases almost linearly with the increase of ν. In more perfect crystals the dependences of α on ν become more complicated. Due to the increase of phase delay of carrier distribution function with respect to the phase of electrical field, when ν increases, the absorption decreases. The decrease is more pronounced in purer crystal, where relaxation time is higher. Only in the purest crystal (with $D = 0.01$ and $\gamma = 1.5$) at $\nu > 5 \cdot 10^{12}$ Hz the frequency dependence becomes very close to ν^{-2} (Drude law), due to the increase of contribution of carriers with energies near the maximum of the relaxation time.