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Infrared Absorption by Free Carriers in Quasi-One-Dimensional Organic Crystals of Tetrathiotetracene–Iodide

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Abstract

The coefficient of long wave infrared (IR) absorption has been calculated at room temperature in quasi-one-dimensional organic crystals of TTT_2I_3 type (TTT is the tetrathiotetracene) 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 interactions of carriers with acoustic phonons and the carriers scattering on impurities are taken into account. Calculations are made for different impurity concentrations and different contribution of each electron–phonon interaction. The dependences of α on radiation frequency ν and crystal parameters are analyzed and the possibility to evaluate the coupling constants of electron–phonon interactions and the degree of crystal purity from experimental measurements of α on ν is demonstrated.