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Lokalizacja ładunku w przewodnikach organicznych z wiązaniami wodorowymi i halogenowymi - badania metodami spektroskopii optycznej

Praca doktorska

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Abstract

The main research objective of this thesis is to gain new information about charge localization and ground state physical properties of new charge transfer salts with hydrogen or halogen bonds. δ-(BEDT-TTF)$_4$(ABS)·4H$_2$O and δ-(BEDT-TTF)$_4$(NBS)·4H$_2$O salts are built of segregated-stacks of donor layers which interact with acceptor layers throught hydrogen bonds. Infrared and Raman spectra show that δ-(BEDT-TTF)$_4$(ABS)·4H$_2$O salt undergoes metal-insulator (M-I) phase transition related with charge ordering. Charge sensitive vibrational bands reveal nonuniform charge distribution at low temperature and charge fluctuactions in the whole temperature range. Crystal structure of the (EDT-TTF-I$_2$)$_2$TCNQF$_n$ charge transfer salts is composed of mixed donor-acceptor layers connected through halogen bonds. Infrared and Raman spectra show that (EDT-TTF-I$_2$)$_2$TCNQF undergoes neutral to ionic phase transition with continuous ionicity change on lowering temperature. The (tTTF-I)$_2$ClO$_4$ and (tTTF-I)ClO$_4$·(CH$_2$Cl$_2$) salts are built of alternating layers of donor and acceptor molecules which interact through halogen bonds. Infrared and Raman spectra show that the (tTTF-I)$_2$ClO$_4$ material undergoes M-I phase transition, and indicate that this transition is triggered by the inter-layer charge disproportionation. It is shown that charge distribution is nonuniform in high temperature metalic phase and essentialy uniform in the low temperature insulator phase. In this PhD thesis, infrared and Raman studies show that hydrogen or halogen bonds in the new materials can play a significant role in the phase transitions incuding charge ordering.