Charge-order fluctuations and electron-phonon coupling in organic superconductors

ALBERTO GIRLANDO, MATTEO MASINO, Univ. of Parma (Italy), NATALIA DRICHIKO, Univ. J. Hopkins, Baltimore (U.S.A.), MARTIN DRESSEL, Univ. of Stuttgart (Germany) — Organic superconductors (SC), like other new classes of SC, are characterized by important electronic correlations. Spin or charge-order (CO) fluctuations have been invoked as mediators in the pairing mechanism, in place of, or in addition to, the conventional phonon mediated pairing. In the phase diagram of BEDT-TTF based 1/4-filled layered charge transfer salts, a CO metal-insulator transition is close to the metal-SC transition, with CO fluctuations in the proximity of the instabilities. We present the characterization of CO fluctuations obtained through optical spectroscopy of SC and non-SC BEDT-TTF salts, with an estimate of the average charge on the molecules and the velocity of charge “jump” from one molecule to the other. It turns out that the latter is not connected to the SC. A correlation seems instead to occur between SC and the average charge on the molecules. We shall also discuss other possible signatures of the charge fluctuations in the optical spectra, as well as the connection between CO fluctuations and intra- and inter-molecular electron-phonon coupling. The relevance of these ideas to the recently discovered class of doped acene superconductors will be shortly discussed.