

Infrared Ellipsometry study of K-doped pterphenyl bulk

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With infrared ellipsometry we studied the lattice and charge dynamics of polycrystalline samples of heavily K-doped and undoped p-terphenyl. For the doped samples with a nominal compositions of K3-p-terphenyl, we observed a pronounced enhancement of some low-energy phonon modes that is in fair agreement with the prediction of lattice dynamical calculations. Moreover, we observed a strong decrease of the eigenfrequency of the high-energy phonons involving C-H vibrations that are not predicted by the calculations. We interpret this latter anomalous phonon softening in terms of a weak polymerization of the K3-p-terphenyl ions. We also observed electronic excitations that give rise to a pronounced polaronic band and a weak Drude-like peak at the origin that is due to free carries with a plasma frequency. As a function of decreasing temperature, the width (scattering rate) and the plasma frequency of this Drude-peak exhibit a gradual reduction that sets in below a structure phase around 190K and evolves continuously toward lower temperature. No anomalous changes of the Drude-response have been observed in the low temperature regime that could be taken as evidence of a bulk-like superconducting transition. An inhomogeneous SC state with a very small volume fraction cannot be excluded based on our optical data.

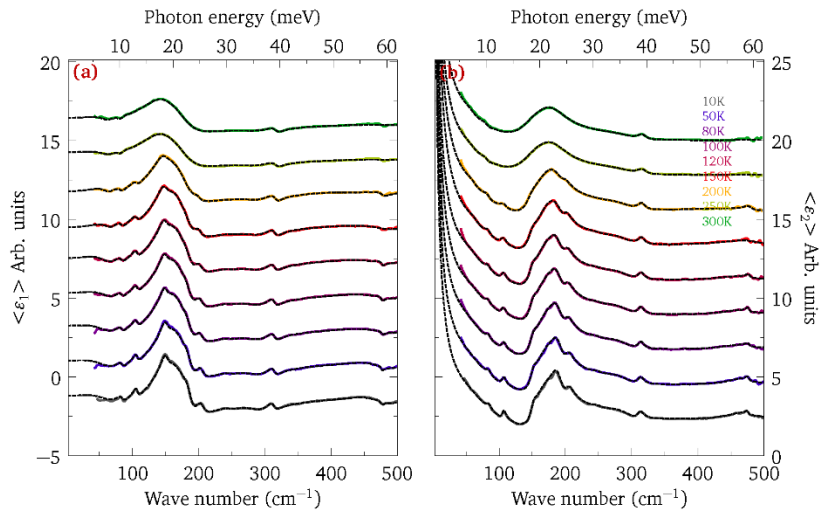


Fig. 1. Far infrared temperature dependent measurement of K-pterphenyl pellet.

References

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