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Infrared Ellipsometry study of K-doped pterphenyl bulk

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The high sensitivity of these K-pterphenyl[1] samples to oxygen and moisture, which renders them unstable and reactive under ambient conditions, makes it difficult to apply a wide range of experimental techniques. Nevertheless, in order to eventually resolve this controversy and confirm the presence of a superconducting phase and identify its nature, it is mandatory to investigate this material with spectroscopic techniques that are sensitive to the bulk-like free carrier response and its coherency. Infrared spectroscopy is such a technique that has already been widely used to study various organic as well as non organic metals and superconductors. For this purpose we have equipped our THz- and Infrared ellipsometers with an optical cell which has windows made from undoped silicon (Si) that provide optical access to the sample and enables ellipsometry measurements at an incidence angle of 75 degree. 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. We also observed electronic excitations that give rise to a pronounced polaronic band and a weak Drude-like peak. An inhomogeneous SC state with a very small volume fraction cannot be excluded based on our optical data.

[1] N. Pinto, C. Di Nicola, A. Trapananti, M. Minicucci, A. Di Cicco, A. Marcelli, A. Bianconi, F. Marchetti, C. Pettinari, and A. Perali, Condensed Matter 5, 78 (2020).
[2] Ren-Shu Wang, Yun Gao, et al; arXiv:1703.06641v1 (2017).