

## **SYMPOSIUM ON 'SUPERCONDUCTIVITY AND LATTICE INSTABILITIES'**

**A symposium on 'Superconductivity and Lattice Instabilities' was held in Gatlinburg, Tennessee, from September 10-12, 1973. Abstracts of the program of this meeting are published on the following pages. The symposium, sponsored by the National Science Foundation, the Office of Naval Research and the Oak Ridge National Laboratory, was organized by P.B. Allen (SUNY, Stony Brook), B.T. Matthias (La Jolla and Bell Laboratories), J.M. Rowell (Bell Laboratories), H.G. Smith (Oak Ridge National Laboratory), L.R. Testardi (Bell Laboratories) and G.W. Webb (RCA Laboratories).**

we have attempted to reproduce the intrinsic transport properties of the organic salt. We shall present measurements of electrical resistivity and thermoelectric power on samples prepared in at least two laboratories, and shall also discuss methods to enhance the reproducibility among crystals.

- 1 FERRARIS J.P., COWAN D.O., WALATKA V. and PERLSTEIN J.H., *J. Am. Chem. Soc.* **95**, 948 (1973).
- 2 COLEMAN L.B., COHEN M.J., SANDMAN D.J., YAMAGISHI F.G., GARITO A.F. and HEEGER A.J., (to be published in *Solid State Communications*).

4. OPTICAL REFLECTIVITY OF TTF-TCNQ  
P.M. Grant, G. Castro and R.L. Greene, IBM Research Laboratory, San Jose, California.

The polarized reflectivity of single crystals of TTF-TCNQ has been measured between  $0.2 \mu\text{m}$  and  $20 \mu\text{m}$  at room temperature, and between  $0.8 \mu\text{m}$  and  $2 \mu\text{m}$  at temperatures down to  $20^\circ\text{K}$ . Metallic like reflectivity is observed for light polarized parallel to the conducting axis, insulating behavior for the perpendicular polarization. Behavior suggestive of a plasma edge is observed at all temperatures near  $1.4 \mu\text{m}$  ( $0.9 \text{ eV}$ ). A Drude analysis of the spectrum yields a plasma frequency of  $\omega_p = 1.38 \text{ eV}$ , a scattering time  $\tau = 2.3 \times 10^{-15} \text{ sec}$  and a background dielectric constant  $\epsilon_0 = 3.3$ . These values are remarkably insensitive to temperature, even near the metal-insulator transition ( $T \sim 60^\circ\text{K}$ ). From  $\omega_0$  and  $\tau$  the optical conductivity, optical effective mass and dimensionless electron-phonon coupling constant are found to be  $\sigma_{\text{opt}} = 900 \Omega^{-1} \text{ cm}^{-1}$ ,  $m_{\text{opt}}^* = 1.7 m_e$ ,  $\lambda \simeq 1.8$ . The approximations involved in deriving these values and their relation to the recently proposed Peierls distortion and paraconductivity in TTF-TCNQ will be discussed.

5. INFRARED AND FAR-INFRARED ABSORPTION IN (TTF) (TCNQ)  
J.B. Torrance, B.A. Scott, D.C. Green and P. Chaudhart, IBM Research, and D.F. Nicolli, Harvard University.

We have measured the infrared and far-infrared absorption spectrum of powders and films of (TTF) (TCNQ) at temperatures above and below the metal-semiconductor transition at  $58^\circ\text{K}$ . At all temperatures there is a broad and extremely intense ( $\alpha > 10^4 \text{ cm}^{-1}$ ) absorption band centered at  $\sim 2800 \text{ cm}^{-1}$  ( $\sim 35 \text{ eV}$ ), which is polarized along the conducting axis. We identify this absorption as the 'charge transfer band', which is associated with *intra*-band transitions, i.e. within the lowest occupied bands of both TCNQ and TTF. In addition, preliminary far-infrared results are reported which indicate a gap considerably lower than the conductivity gap. We wish to point out and emphasize that our results do not agree with the predictions of a simple one-electron model for the Peierls transition. It is necessary to consider electron correlation effects and to regard this absorption as due to the excitation of *correlated* electron-hole pairs. In fact, we would estimate  $U \sim 0.35 \text{ eV}$  compared to  $t \sim 0.1 \text{ eV}$ . The implication of our results for the nature of both the transition at  $58^\circ\text{K}$  and the conductivity will also be discussed.

6. CONDUCTIVITY, SUPERCONDUCTIVITY AND THE PEIERLS INSTABILITY.\*  
B.R. Patton<sup>†</sup> and L.J. Sham, Univ. of Calif., San Diego.

The properties of a one-dimensional model of the electron-phonon system which exhibits the Peierls instability are investigated. The instability tends to

suppress BCS pairing and below the structural transition results of the conductivity favorably with recent measurements of TTF-TCNQ but cannot account for conductivity peaks found

\* Work supported by NSF Grant GH 37719.

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7. THEORY OF PSEUDO-ONE-DIMENSIONAL SUPERCONDUCTIVITY  
J. Bardeen, Univ. of Calif., San Diego

Provided that the transition processes is sufficiently strong, the conductivity associated with the pseudo-one-dimensional model appears to be far too large, and anomalously high values are observed. Hoeger *et al.* for a few samples

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