

treatment for 8 min.

Reagent 2 is a polishing solution and gives a uniform mirror surface on any plane. It consists of 1 part 30% H_2O_2 (oxidant), 5 parts concentrated H_2SO_4 (solvent for oxides), and 2 parts H_2O . Figure 4a shows a surface treated with this, while Fig. 4b shows the same surface treated with reagent 1.

The solution must be allowed to stand for 20-30 min after preparation to allow it to cool; the etching rate when cool is 3-4 μ /min.

This reagent is suitable for removing layers heavily doped by diffusion and also for etching diffusion p-n junctions in GaAs.

The two reagents together provide all the etching operations needed with GaAs. My experience with these and with other reagents [1, 2] has shown that hydrogen peroxide gives better results with GaAs than do acid oxidants.

REFERENCES

1. J. W. Faust and A. Sagar, J. Appl. Phys., 31, 2, 231-333, 1960.
2. F. A. Cunnel, J. T. Edmond, and W. R. Harding, Solid State Electronics, 1, 2, 97-106, 1960.

10 March 1964

Gor'kii University
Khar'kov

DIELECTRIC PARAMETERS OF ORGANIC SEMICONDUCTORS

P. K. Mitskevich and M. I. Bashmakova

Izvestiya VUZ. Fizika, No. 3, pp. 155-157, 1965

There is a discontinuous change in conductivity when some organic semiconductors melt [1-4]. The bonding in simple semiconductors is via dipoles and mutual polarization of electron shells, so this change in conductivity must be related to relaxation effects, which requires a study of the dielectric parameters over a wide temperature range. No data on this are to be found in the literature.

Here we report ϵ' and $\tan \delta$ at 3.2 cm for phenanthrene, β -naphthoquinoline, o-phenanthroline, toluyl-2-azo-1-naphth-2-ol, and the diamide of collidine dicarboxylic acid in diethyl ether. An RL-4 line was used. The centimeter range was chosen because many substances show anomalous absorption in this range, so ϵ' and $\tan \delta$ are sensitive to structural changes. We used a fixed layer of material at the short-circuited end of the guide [5], because this gives very simple formulas [6].

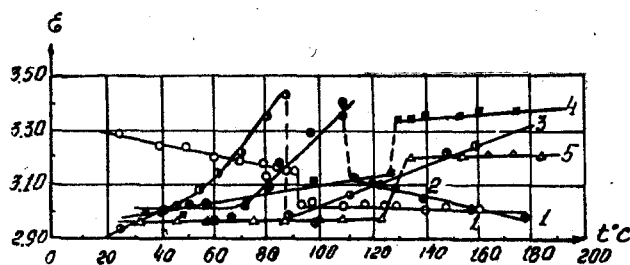


Fig. 1. Temperature dependence of ϵ' for 1) phenanthrene, 2) β -naphthoquinoline, 3) o-phenanthroline, 4) toluyl-2-azo-1-naphth-2-ol, 5) diamide of collidine dicarboxylic acid in diethyl ether.

The compounds differ in properties in accordance with their polarity; nonpolar ones (benzene, naphthalene, phenanthrene) have ϵ' decreasing as T increases, with a stepwise fall in ϵ' on melting (curve 1 of Fig. 1), with only small $(d\epsilon'/dT)/\epsilon'$ (e. g., 6.5×10^{-5} for solid phenanthrene). The electronic part of the polarization is independent of temperature, so the fall in ϵ' is ascribed to expansion. In addition, $\tan \delta$ is small. The polar ones have ϵ' and $\tan \delta$ increasing with temperature on account of relaxation effects [7]. The relation of ϵ' to T alters as other atoms are introduced into phenanthrene; the temperature coefficient becomes positive for o-phenanthroline in both states (curves 2 and 3 of Fig. 1), with a stepwise fall in ϵ' on melting. More complicated compounds such as the naphthol and diamide have small positive temperature coefficients for (6×10^{-4} for the solid) with a stepwise increase in ϵ' on melting (curves 4 and 5 of Fig. 1). Figure 2 shows typical curves for $\tan \delta$, which have two peaks. The low-temperature one corresponds to change

in molecular orientation; the trend in ϵ' also indicates solid-state relaxation [8]. The dipolar molecules become more mobile as T increases, so the dipole component increases. Figure 3 illustrates this in terms of $\epsilon - n^2$ for β -naphthoquinone-

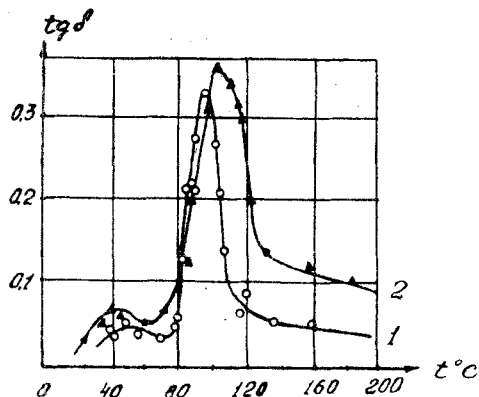


Fig. 2. Temperature dependence of $\tan \delta$ for 1) β -naphthoquinoline, 2) o-phenanthroline.

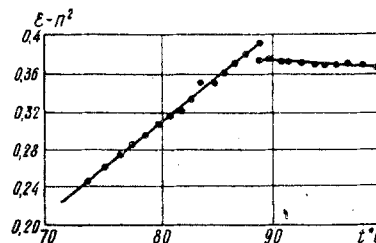


Fig. 3. Temperature dependence of the dipole component of ϵ' for β -naphthoquinoline.

line. The second peak (see table) corresponds to phase transition for all the polar compounds; it is more prominent than the low-temperature one and indicates a marked change in structure on melting [9, 10]. The ϵ' and $\tan \delta$ curves are sim-

Compound	$t_{pl}, ^\circ C$	Peak I		Peak II	
		$tg \delta_{max}$	$t_{max}^0, ^\circ C$	$tg \delta_{max}$	$t_{max}^0, ^\circ C$
Phenanthrene	100	—	—	—	—
β -naphthoquinoline	92	0.046	47	0.326	98
o-phenanthroline	100	0.064	41	0.355	104
Toluy1-2-azo-1-naphth-2-ol	126.3	0.044	65	0.072	126
Diamide of collidine dicarboxylic acid in diethyl ether	131	0.084	59	0.215	136

ilar, so the UHF loss mechanisms must be similar, and, in particular, are probably due to relaxation processes. The most probable relaxation time is about 10^{-10} sec, a value characteristic of unassociated liquids.

REFERENCES

1. N. Ril, Zh. Fiz. Khim., 29, no. 6, 959, 1955.
2. E. O. Förster, J. Chem. Phys., 37, no. 5, 1962.
3. A. Bornmann, J. Chem. Phys., 36, no. 6, 1962.
4. M. I. Bashmakova, Collected Papers of Dnepropetrovsk Engineering Construction Institute [in Russian], no. 29, 17, 1963.
5. G. P. Mikhailov and A. M. Lobanov, Zh. Tekh. Fiz., 28, no. 2, 267, 1958.
6. G. D. Burdun, Zh. Tekh. Fiz., 20, 813, 1960.
7. G. P. Mikhailov and A. M. Lobanov, Zh. Tekh. Fiz., 28, no. 2, 273, 1958.
8. G. I. Skanavi and G. A. Lipaeva, Zh. Eksp. Teor. Fiz., no. 5, 824, 1956.
9. S. S. Urazovskii and I. I. Ezhik, Izv. VUZ. Fizika, no. 4, 146, 1962.
10. S. S. Urazovskii and I. I. Ezhik, Zh. Fiz. Khim., 35, no. 1, 156, 1962.

12 March 1964

Dnepropetrovsk Engineering Construction Institute

DEGREES OF PARITY NONCONSERVATION IN Θ AND τ DECAYS

L. G. Tkachev

Izvestiya VUZ. Fizika, No. 3, pp. 158-159, 1965

The Θ and τ decays of K^+ mesons gave the first evidence for parity nonconservation, although each decay taken alone shows no asymmetry indicating nonconservation that can be measured (in this we have a difference from β -decay