Figure 2. Reflection spectra of anthracene crystal before (1) and after (2) photo-oxidation.

T6
Vibrational Relaxation in Condensed Media

S. H. LIN, H. P. LIN and D. KNITTEL
Department of Chemistry, Arizona State University, Tempe, Az. 85281 (U.S.A.)

A master equation approach has been developed to describe the vibrational relaxation and a model for calculating the rate constant of vibrational relaxation in condensed media based on the assumption that the short-range repulsive portion of the intermolecular force is responsible for inducing the vibrational relaxation has been presented [1, 2].

In this investigation, we are concerned with the temperature effect on vibrational relaxation and the vibrational energy transfer from the vibrationally excited donor to the acceptor. For the temper-

ature effect, we present numerical results to show the temperature dependence of the rate constant of vibrational relaxation and to discuss the validity of the rate constants obtained from the use of the weak coupling approximation and the strong coupling approximation. It is shown that although the temperature effect is extremely large over the temperature range $T = 0$ to $T = \theta_E$, the Einstein temperature of the medium, for the temperature range $T = 0$ to $T = 0.3\,\theta_E$, the rate constant varies slowly with temperature.

For the vibrational energy transfer, we derive the master equation to describe the time dependent behavior of the excited donor, and the expression for the rate constant of vibrational energy transfer. The master equation is solved to study the temporal behavior of the excited donor as a function of the acceptor concentration. Numerical results are presented to demonstrate the theoretical results.

1 G. R. Fleming, O. L. J. Gijzeman and S. H. Lin, J. Chem. Soc., Faraday Trans. II, 70 (1974) 37.
2 S. H. Lin, J. Chem. Phys., 61 (1974) 3810.

T8
C$_2^-$ Molecular Ion: Long Range Electron Tunnelling and B$^2\Sigma_u^+ \leftrightarrow$ a $^4\Sigma_u^-$ Intersystem Crossing in Rare Gas Lattices

V. E. BONDYBEY
Bell Laboratories, Murray Hill, N.J. 07974 (U.S.A.)

The B $^2\Sigma_u^+$ fluorescence of C$_2^-$ displays an extreme Personov effect — narrowing in emission of an inhomogeneously broadened absorption spectra excited by monochromatic light. The temperature dependent single site emission spectra are consistent with Rebane impurity spectra theory and quadratic electron-phonon coupling. C$_2^-$ appears to be a substitutional guest in Ar, Kr, and Xe, and to displace two or more atoms in Ne. The principal vibrational relaxation pathway within the B state involves sequential steps through two vibrational levels of the previously predicted (yet unobserved)