

# The Red-Edge Effects in Laurdan Solutions

V. I. Tomin, M. Brozis, and J. Heldt

Institute of Physics, Pomeranian Pedagogical Academy,  
76-200 Slupsk, Arciszewskiego str. 22B, Poland

Reprint requests to Prof. V. I. T; Fax (1033)-59-8405-339, E-mail: tomin@wsp.slupsk.pl

Z. Naturforsch. **58a**, 109 – 117 (2003); received January 14, 2003

The luminescence spectrum of laurdan in glycerol consists of two bands with maxima at 425 and 500 nm. The strong dependence of this spectrum on the energy of the excitation quanta is demonstrated. When, excited on the red-edge slope of the absorption band, it is investigated at various temperatures. The biggest red shift (about 10 nm) of  $\lambda_{\text{max}}$  is found for the long wavelength band at low temperature, where the solvent forms a rigid matrix. A small shift, about 3–4 nm, and a change of the luminescence band shape occurs on increasing the temperature to 370 K. Simultaneously, intensity changes occur in the excitation spectra when the maximum intensity of the two emission bands is recorded. From the received data, the differential excitation spectrum has been determined. The additional absorption contributes to the luminescence of the short wavelength band.

The deconvolution of the luminescence decay data obtained separately for the luminescence bands results in common components in the sub- and nanosecond time range with different participation. The experimental data testify the presence of an additional mechanism, responsible for the heterogeneity of the solution, which differs from the well-known solvent molecule reorientation.

Torsion oscillation of the  $\text{N}(\text{CH}_3)_2$  functional group in the laurdan molecule is necessary to take into account as well as the statistical properties of the laurdan solvate shells. The observed luminescence properties are explained taking into account the simultaneous existence of local-excited and charge transfer states in the solute molecules.

*Key words:* Laurdan; Luminescence; Excitation Spectra; LE (local-excited) and CT (Charge Transfer) States; Inhomogeneous Broadening of Spectra; Intermolecular Relaxation.