RELAXATION PROCESSES IN SUPER-COOLED LIQUID

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The acoustic relaxation and Rayleigh line wing (RLW) have been studied in super-cooled phenyl salicylat over the temperature range from -30C to 65C. The temperature dependence of the velocity and absorption of ultrasound in phenyl solicylat was determined by measuring the diffraction of light by sound waves at frequencies of 5, 15, and 25 MHz. In the hypersonic frequency range (7 - 11 HHz) the velocity and absorption of the sound were determined from the shift and width of Brillouin components in the spectra of scattered light found with spectral apparatus with two-pass Fabry-Perot interferometer. Spectra of depolarized scattering of light were measured on an apparatus with a spherical Fabry-Perot interferometer. Analysis of the obtained results has shown that the frequency and temperature dependencies of sound velocity and absorption are in good agreement with the prediction of the theory [a]. The calculated times of acoustic relaxation t vary from 40 ps to 2.5 ms over experimental range of temperatures. From the width of the spectra of depolarized light scattering the values of anisotropy relaxation time t' were determined. They are from 1.5 ns to 0.35 ms in temperature range from -16C to 16C. A comparison of t and t' (our results, and results of other authors [b] for RLW over the temperature range from 12C to 122C) has shown that the temperature behavior of t, and that for t', are identical, and, in accordance with the theoretical ideas, t'=2t. The analysis of acoustical characteristics allowed us to find out the existence of high-frequency relaxation process related to translational modes of motion, as we assume.

[a] H. Imura, and K. Okano, Chem. Phys. Lett. 19, 387 (1973).
[b] A. D. Enright, and B. P. Stoicheff, J. Chem. Phys. 64, 3658 (1976).