Peculiarities of Behavior of Acoustic Absorption Coefficient in the Vicinity of Critical Point

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Peculiarities of behavior of acoustic absorption coefficient in solutions having critical concentration in the vicinity of critical separation temperature were studied on the basis of acoustic spectroscopy approach. As the subject of investigation we took binary solutions of nitromethane-n-amyl alcohol (I) with amyl alcohol 0.384 mole fraction critical concentration and nitrobenzene-hexane (II) with nitrobenzene 0.4 mole fraction critical concentration. The study was conducted within the range of temperatures above the critical separation temperature ($T>T_c$). Amplitude absorption coefficient of the investigated solutions was measured using pulse-phase method within the temperature range from critical separation temperature to 323 K and within the frequency band from 5 to 2500 MHz.

The results of our experimental study of acoustic absorption coefficient show that in the investigated solutions significant dependence of acoustic absorption value on frequency, concentration and temperature is observed, especially at low frequencies.

It is shown that in investigated binary solutions having critical parameters the acoustic areas consist of two areas of dispersion. For each of them the process is characterized by the same relaxation time. The low frequency area of relaxation relates to fluctuations and the high frequency area relates to intermolecular processes which take place in the system and arise from intercrosslinking and bond breaking when critical fluctuations form.

The conducted experimental studies prove that acoustic methods applied within the broad frequency band allow to simultaneously observe the processes related both to fluctuating nature of substance and molecular peculiarities of liquid systems, in the same liquid systems having critical concentration in the vicinity of critical temperature point.
The findings confirm the dynamic theory of critical phenomena concerning asymptotic behavior of acoustic absorption coefficient within boundary areas.