ACOUSTIC SPECTROSCOPY OF POLYPROPYLENGLYCOLS AND KINETICS OF REARRANGEMENT PROCESSES OF THEIR STRUCTURE

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S u m m a r y

The acoustic properties of three liquid polypropylenglycols (PPG) with molecular masses of 400, 1052, and 2080 in the temperature range from 293 to 353 have been investigated by acoustic spectroscopy and viscosimetry methods. The amplitude coefficient of sound attenuation α in the frequency range from 1.0 to 2500 MHz, velocity of sound propagation c in the frequency range 1 – 400 MHz, density, and shear viscosity coefficient have been measured. The measurements of α and c of PPG-400 in the pressure range from 0.1 to 50 MPa have been carried. It has been shown that acoustic spectra of liquid PPG in the studied frequency and temperature ranges consist of two simple regions of dispersion. The relaxation strengths, relaxation times, and a number of other parameters of simple regions of dispersion have been calculated. Probable molecular mechanisms of the processes responsible for the simple regions of dispersion have been analyzed. It has been proved experimentally that the first low-frequency region of dispersion is caused by rotational isomeric relaxation, in particular, by local rotations around C– C and C– O-bonds along the main (oxyethylene) chain of PPG. The thermodynamic and kinetic parameters of rotational isomeric relaxation have been calculated. It has been shown that the second region of dispersion is caused by breaking and forming the weak intermolecular bonds which are responsible for the formation of space-time structures (nets).