DIELECTRIC PROPERTIES OF BUTADIENE OLIGOMERS

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ABSTRACT

The objective of this research is to measure and to determine the origin of the dielectric relaxation of oligomers of butadiene. The analysis and subsequent discussion is based first on detailed observation of frequency dependencies of the relaxation processes and second on the comparison of dielectric measurements made at different temperature.

1 INTRODUCTION

The purpose of my research is to measure the dielectric relaxation spectra and it is necessary to select appropriate analytical method for the research of characteristics of materials. Ones of the modern experimental methods are dielectric relaxation spectroscopy. The DRS studies molecular dynamics of current carriers, respectively dipoles and is created by set of theories and methods used for experimental research of this dynamics. DRS can be used to observe several material systems, and this research was directed to DRS of oligobutadiene.

2 SAMPLE

Oligomers of butadiene find on interesting application as adhesives, insulation of wires and cables, bonding PS foam, PU modification and sealants. In the ordinary way, hydroxyled oligobutadien is clear colorless till yellowish viscous liquid, that is non-miscible with water and alcohols. However it is well miscible with non-polar organic liquids, oil and pitches. Oligobutadiene is soluble easily in some different solvents and appertain to unsaturated alkaline hydrocarbons, which contain functional group OH. It is produced by using polymeric reaction.

3 EQUIPMENT

Measurements were carried out using the HP16451B electrode system and the Hewlett Packard HP4284A precision LCR analyzer, and the dielectric test fixture electrode. Measuring with the precision LCR analyzer is based on bridge techniques with auto-

calibration and it is measured results are spam the frequency range 20 Hz-1 MHz.

4 EXPERIMENT EVALUATION

In our laboratory we examined their dielectric properties, samples of oligobutadiene supplied were at the room temperature very viscous so that a droplet of oligobutadien was expelled from a syringe in the form of a droplet to the bottom electrode, then the top electrode was screwed down, so that the droplet flowed away and formed a dielectric layer between both electrodes. The distance between samples was kept constant 100 µm by glass fibers. An important issue was the selection of the sufficiently small amount of oligobutadien. In this research the characteristics ε″= F(f) were measured and evaluated experimentally for the temperatures below the room temperature (down to -20 °C). With the help of dielectric relaxation spectroscopy method we obtained the results, which we analyzed. Data analysis has substantiated the appearance of relaxation processes in the sample of oligobutadiene.The relaxation map of the tested sample was plotted and the results are shown in figures 1 (real part of the complex permittivity) and 2 (imaginary part of the complex permittivity) below.

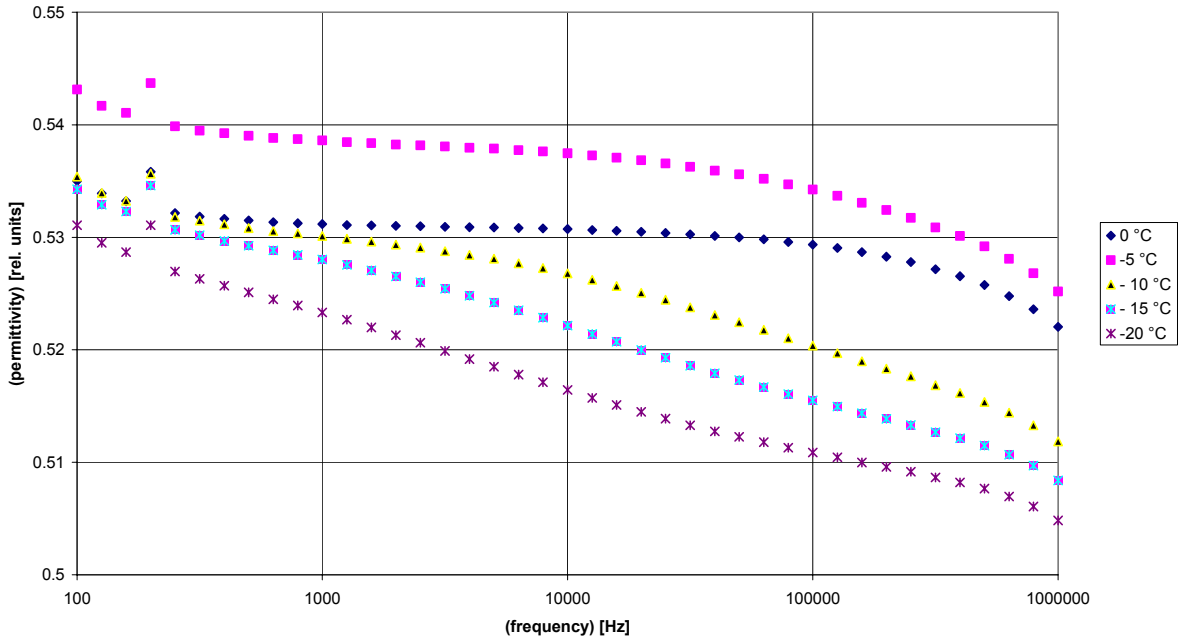

Fig. 1: *Real part of the complex permittivity versus frequency.*

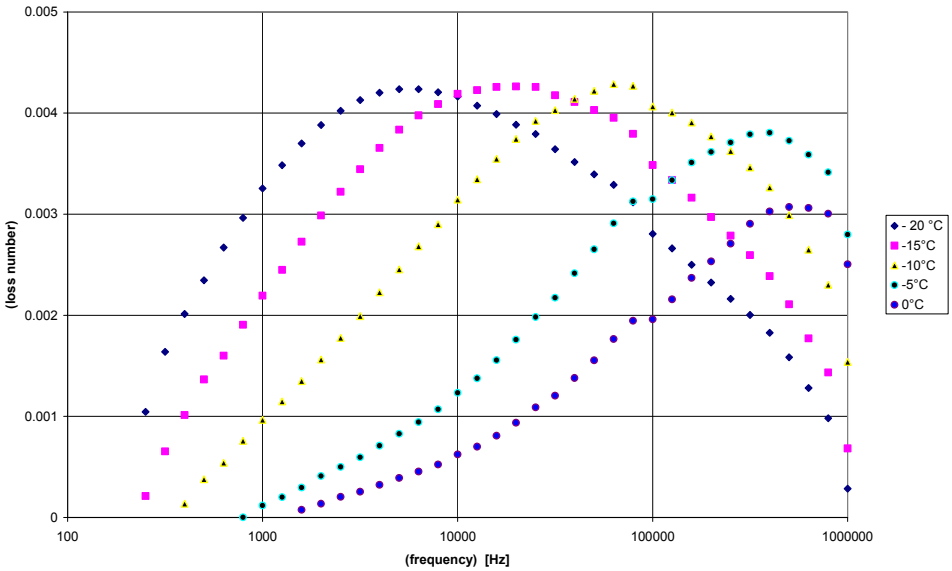

Fig. 2: *Imaginary part of the complex permittivity versus frequency.*

5 CONCLUSION

Dielectric relaxation spectra of hydroxyled oligobutadiene LBH were measured in the frequency range from 20 Hz to 1 MHz in temperature range from 0 °C to -20 °C. The measurements might be interpreted as the evidence of the presence of at least one relaxation process right side, perhaps two at higher temperatures. The slope of the relaxation maximum at the room temperature (not shown here) has the value of (0.48) which indicates a partially cooperative character of dipole motions. The relaxation process shifts from the high frequency side to the low frequency side and becomes unsymmetrical as the experimental temperature decreases. The lack of symmetry might be due to the presence of either another relaxation process or conductivity which is seen at room temperature.

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