Amorphous-crystalline equilibrium in azide-containing oligooxetane blends

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Azidcontaining oxetane oligomers are perspective class of power-hungry polymers for development of block-copolymers and composites on their basis. Information on phase equilibriums for initial components is of fundamental importance for prediction of structure and properties of these materials.

In this work the data on phase equilibrium in oligooxetane mixtures with different structures and molecular weights is presented.

Oligomers based on 3,3-bisazidomethyl oxetane (BAMO) and 3-azidomethyl-3-methyl oxetane (AMMO) were used in this study. The molecular weights of the oligomers were in the range 1000 to 23000.

The phase and physical transitions of the oligomers and their mixtures were determined by DSC. The compositions of coexisting phases in heterogeneous area were estimated in situ by microinterferometry upon the direct contact of the oligo-AMMO and oligo-BAMO components. The comparison of DSC and microinterference data allowed to obtain complex information about the system state in the wide temperature and concentration range.

Summarized phase diagrams of the oligo-AMMO – oligo-BAMO mixtures were plotted based on the all data obtained. The diagram shows liquidus lines, crystallization lines, binodal curves with the Upper Critical Temperature of Mixing (UCTM), spinodal curves, and glass transition lines. The regions of melts, metastable states and heterogeneous states for studied systems were determined.

It was found that oligomer mixtures were characterized by complicated amorphous-crystalline phase equilibrium. Depending on the molecular weights of components, the UCTM point is located either above or below oligo-BAMO melting point. We were able to register experimentally the amorphous separation below liquidus line, as well as to derive the part of the binodal curve in the area of the supercooled melts.

Structural-morphologic organization of different mixtures oligo-AMMO – oligo-BAMO was illustrated by SEM micrographs.

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