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Modifying effect of amphiphilic macromolecular brushes on supramolecular structure of microporous polymers based on macroinitiator and 2,4-toluylene diisocyanate

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Abstract

The influence of amphiphilic macromolecular brushes with polysiloxane backbone on the processes of microphase separation of microporous polyetherisocyanurates was studied. Their supramolecular structure is formed by the core-shell type. Synthesis of microporous polyetherisocyanurates was carry out by interaction 2,4-toluylene diisocyanate with an anion macroinitiator in toluene and reaction conditions leading to formation polyisocyanurates. Block copolymer of propylene oxide with ethylene oxide having a molecular weight 4200 was used as a macroinitiator. Part of the hydroxyl groups in it was replaced by potassium alcoholate. According to measurements of the temperature dependence of loss-angle tangent, the appearance of dipole-group losses and decline of α-transition temperature indicate a significant effect of amphiphilic macromolecular brushes on the processes of microphase separation in the studied polymers. These polymers are characterized by the development of resilient deformation due to the high level of combining polyisocyanurates in the vitrifiable microphase. Using of amphiphilic macromolecular brushes leads to a fivefold increase in reversible deformation, which develops under uniaxial tension of the samples. It is shown that the changes in the elastic deformation and the surface morphology of modified samples of microporous polymers are due to the strengthening of the microphase separation degree of rigid-chain and flexible-chain components.

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