INFRARED SPECTRA OF MECHANICAL TREATMENTED POLYETHYLENE TEREPTHALATE

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It is known that mechanocreking (the breaking of chains as a result of mechanodestruction) is available only in that case if the movement of chain is excluded and separate chain segments move in the areas restricted by intensity inter- and intramolecular interactions. But the mechanical actions on polymers that are able to cause mechanocreking lead to the mutual movement of individual elements of the structure, that is to change of overmolecular organization. The purpose of this work is the studying of the influence of mechanochemical transformations on supramolecular structure of mechanically treated polyethylene terephthalate (terylene).

It is known, that terylene represents equilibrium mixture of two isomers. A lifetime of isomers is enough for each isomer to give its vibration spectra and the spectra contains lines of both isomers of this polymers. According the selection rule half of terylene vibrations is active in infrared spectra and second half – in Raman spectra. For the analysis the infrared bands of vibrations in the range of 2800-3200 cm\(^{-1}\) are selected. In this interval there are bands of symmetrical and antisymmetrical vibration of cis - isomer and bands of antisymmetrical vibration of trans – isomer. It is thought, that in terylene the principle difference in spectra of crystalline and amorphous sample is arise not by different intermolecular interaction but by the rotational isomeric influence. The studied bands are not sensitive to conformational change. Therefore they can be used for estimation of the contribution of intermolecular interactions on the overmolecular structure. It was shown, that the IR spectra of terylene films before and after milling are identical. Probably the consequences of mechanical destruction were inappreciable (except for the diminution of the molecular weight) or they do not appear in this area of the spectra. It is known, that structural sensible bands of terylene are \(v=1242\) cm\(^{-1}\), \(v=993\) cm\(^{-1}\) (band of orderliness) and \(v=504\) cm\(^{-1}\) (band of an amorphism).

The deep change occur at a slow monoaxial stretching of terylene films. The broadening of bands at 2920 cm\(^{-1}\) and 3075 cm\(^{-1}\), bound with the magnification of a degree of a polydispersity of a polymeric compound observed. The film loses a transparency and its surface becomes matted. A system of thin crazes - “Cracking of argentums”are formed. Visually it is observed as oraque bands. The “Cracking of argentums” is considered at the phenomenon preceding to macroscopic fracture of polymeric compound. Their formation is bound to interaction of free radicals – yields of a mechanodestruction – with a surrounding medium.