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Low-frequency acoustic treatment of polyurethane polyol component

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Abstract

The work is devoted to low-frequency acoustic effects on the initial components for synthesizing various types of polyurethanes: glycols, triols, polyoxyethylene-propylene glycols and polydiglycol adipates. The 'resonant' frequency of treatment has been detected, which is 7 to 9 kHz for various hydroxyl containing compounds under study.

The dependence of viscosity on the time of the acoustic treatment of polyethylene, polyethylene-butylene glycol adipates has the extremum on the 15-20 minute of treatment, which is associated with the formation of associates formed by hydrogen interactions. The latter is confirmed by IR, UV and ^{1}H NMR spectroscopy, thermovisiometry and electron microscopy. The further acoustic treatment leads to the destruction of the associates formed and, consequently, decrease of viscosity with the formation of qualitatively new associates.

The acoustic treatment of polyglycol adipates revealed the acceleration of interaction with 2,4-toluylenediisocyanate: for polyethylenglycoladipate 2.57 times, for polyethylene-butylene glycol adipates 4.93 times. With increasing the treatment time up to a definite limit the rate of the process increases due to the formation of associative structures of spatial ordering favorable for their interaction with the diisocyanate. The effect of acoustic action is preserved for about 1.0-1.5 hours.

Using ^{1}H NMR method with polyesters we detected the cause-effect relationship in viscosity and reactivity change of greater degree at the acoustic treatment of PEG-adipate than polyethylene-butylene glycol adipate. Lifetimes of polyester associates at 65° C do not exceed 0.5 ms and several times more for polyethylene glycol adipate as compared to polyethylene-butylene glycol adipate.