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COPOLYMERIZATION OF VINYL CHLORIDE WITH 2PHENYLACRYLOYLAMINOBENZIMIDAZOLE

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Annotation: *In this study, the kinetics of copolymerization of VK with 2phenylacryloylaminobenzimidazole (FAB) is investigated. The content of FAB in the copolymers was determined by elemental analysis and also confirmed by UV spectra of solutions of copolymer samples in tetrahydrofuran. The kinetics of copolymerization of VC with FAB was studied by the gravimetric method.*

Keywords: *Vinyl chloride (VX), copolymer, initiator, radical, polymerization,*

Relevance. Co-polymerization of vinyl chloride (VC) with nitrogen- and sulfur-containing heterocyclic compounds allows one to obtain a polymer with increased thermal stability, improved adhesion, and good physical and mechanical properties. Polymerization of VC in an aqueous environment has a number of features due to the fact that water is a precipitant for polyvinyl chloride and its copolymers. Due to the good thermal conductivity of water, local heating is not observed, which prevents gelation during polymerization.

Experimental part: The purpose of this work is to study the kinetics of copolymerization of VC with 2-phenylacryloylaminobenzimidazole (FAB). Suspension copolymerization was carried out in evacuated glass ampoules at T = 333 ± 0.5. K, with the initiator dinitrile azobiisobutyric acid (DAA) and a protective colloid in an amount of 0.1% of the aqueous phase at a ratio of water: monomer = 3:1. The content of FAB in the copolymers was determined by elemental analysis and also confirmed by UV spectra of solutions of copolymer samples in tetrahydrofuran. The kinetics of copolymerization of VC with FAB was studied by the gravimetric method. In order to determine a quantitative assessment of the inhibitory ability of FAB, bulk polymerization of VC was carried out and the ratio of the inhibition constant to the growth constant was calculated using the Bagdasaryan equation.

To calculate the constant of suspension copolymerization of VC with FAB, copolymerization was carried out to 7±2% conversion.

Results and its discussion: The composition of the reaction mixture affects the order of the reaction rate in terms of the content of monomer and initiator AIBN. When PAB is used in small quantities, the order of magnitude of the reaction rate deviates from the ideal value, apparently due to the occurrence of the chain transfer reaction to the comonomer. The kinetics of copolymerization of vinyl chloride with FAB shows that the introduction of FAB into the VC polymerization reaction system leads to a decrease in its rate. Apparently, this is due to lower free radical activity. It is known that the presence of small amounts of inhibitors in the VC polymerization system changes the catalytic nature of the process to a stationary process. A similar phenomenon is observed when VC FAB is introduced into the polymerization medium in quantities of more than 1 mol%. At these concentrations of FAB, the graphical dependence of the copolymerization kinetics becomes linear. That is, there is no “polymerization acceleration site.” The inhibitory ability of FAB in the reaction (K/Kr = -10-5) polymerization of VC is apparently associated with the formation of low-active radicals as a result of chain transfer through the imidazole heterocycle.

The quantitative values of r1 and r2 are the most important characteristics of copolymerization and determine the composition and structure of the synthesized copolymer. The reactivity of VC

(r1) is significantly higher than the activity of FAB. The decrease in the polymerization rate is also confirmed by the factor (for VX P*=0.09). The reactivity values of which are given in the table.

Table

Values of copolymerization constants.
Factors of polarity and activity in the copolymerization of vinyl chloride with 2-phenylacryloylaminobenzimidazole

Method	r_1	r_2	r1 r2	For FAB			
				Q	e	Δe	P*
EBP(analyst)	3,11±	0,09±	0,28	0,017	1,33	1,13	0,053
Kelena-Tydesa	0,145	0,004	0,21	0,019	1,45	1,25	0,062
	2,98	0,07					

P* is a reactivity factor that takes into account the combined influence of conjugation and polarity.

Conclusions: The discrepancy between the Δe values also shows significant differences in the nature of the electron exchange interaction between the radical ends of the growing chains and the joining monomer molecules, which determines the differences in the dependence of the copolymerization rate on the composition of the monomer mixture. Using the formulas of Wald and Medvedev, we calculated the probability of the intramolecular distribution of units along the length of the macromolecular chain and their average length.

Based on the above, we can conclude that FAB is a low-active monomer compared to VC.

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