RESEARCH OF RADICAL COPOLYMERIZATION OF POLYPROPYLENE FUMARATE PHTHALATE WITH METHACRYLIC ACID

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With the development of the construction industry, light and heavy industries, material-intensive materials (metal, wood, concrete) are being replaced by polymer compositions obtained on the basis of unsaturated polyesters (NP) of various compositions. So, on their use as a binder, the production of various polymeric sealants and adhesives is based. As a film-forming or impregnating composition, NPs have found application in the paint and varnish industry. When using them as a casting composition, it becomes possible to obtain high-quality cast products of increased strength, including reinforced composite materials, on the basis [1].

With the ability to copolymerize relatively easily with vinyl monomers, Unsaturated Polyesters (UP) form grafted or structured polymeric materials exhibiting a number of valuable properties, making them a promising material, has found application in various fields of human activity. Such kind of polymer mesh reaction formed by copolymerization of Unsaturated Polyesters (UP) with other monomers is referred to as "curing" or "crosslinking".

Obtaining polymers based on unsaturated polyesters with the required combination of properties is possible only on the basis of knowledge of the kinetics and mechanism of their radical copolymerization processes with ionic monomers. Since the study of the kinetics, constants and copolymerization parameters of unsaturated polyesters with ionic monomers remains open and, therefore, relevant, it seemed interesting and expedient to fill the noted gap.

The research investigated binary radical copolymerization of polypropylene fumarate phthalate [2] with methacrylic acid in dioxane medium at different molar ratios of the initial monomer mixture. A brief figure is shown in Figure 1.

The kinetics of the copolymerization reaction were studied dilatometrically. Using the chromatomass of spectroscopy [3], the composition of the synthesized copolymers was determined. The Mayo-Lewis, Fineman-Ross and Kelen-Tudosh integral method [4] calculates constants and parameters of radical copolymerization. The Q-e parameters were calculated based on the copolymerization constants using the Alfrey-Price equation [4]. The results of kinetic studies show that with an increase in the mole fraction of methacrylic acid in the solution, the reaction rate and sorption capacity of the copolymers increase. It has been found that the copolymerization of methacrylic acid with polypropylene fumarate phthalate has a lower reactivity.

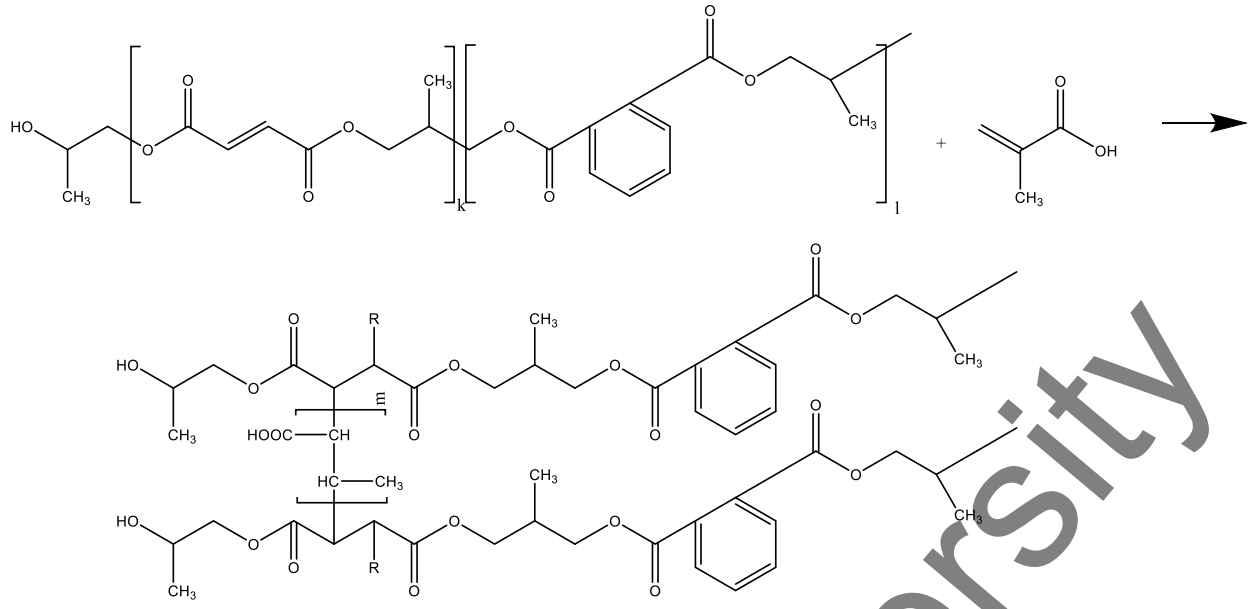

Figure 1 – Brief copolymerization scheme of Polypropylene fumarate phthalate with methacrylic acid

It has been shown that the degree of unsaturation of copolymers is directly proportional to the content of polypropylene fumarate phthalate in the initial monomer mixture.

Kinetics of thermal degradation of polymeric materials is usually studied by weight loss at a constant temperature or during heating. Hence, the activation energy and other kinetic parameters of the thermal destruction process are determined. One of the fastest and most accessible methods for studying the kinetics of these processes is TGA. Weight methods of TGA do not provide an opportunity to judge the proportion of gaseous degradation products. This is especially true for processes associated with the release of hydrogen and other substances with low molecular weights, the accuracy of determining the amount of which by the weight method is low.

Thus, a brief overview of the above studies shows that as a result of radical copolymerization of polypropylene fumarate phthalate with methacrylic acid, it is possible to obtain new polymers of a spatially crosslinked structure. The obtained results demonstrate the possibility of controlling the physicochemical properties of copolymers based on polypropylene fumarate phthalate and methacrylic acid by changing the initial composition of the polymer mixture, which makes it possible to create new materials with a predetermined program of behavior.

References

1 R Keith Mobley. Plant Engineer’s Handbook; Butterworth-Heinemann: Boston, 2001.

2 Kandelbauer A., Tondi G., Zaske O.C. Goodman S.H. In Handbook of Thermoset Plastics. – San Diego: William Andrew, 2014.- 111 p.

3 Burkeev M.Zh. Poly(propylene fumarate phthalate) and acrylic acid radical copolymerization constants and parameters / M.Zh. Burkeev, G.M. Zhumanazarova, G.K. Kudaibergen et al. // Bulletin of the Karaganda university. Series Chemistry. — 2020. - No. 1(97). - P. 68-74

4 Zolotov, Yu.A., Dorokhova, E.N., & Fadeeva, V.I. (2000).Fiziko-khimicheskie metody analiza [Physico-chemical methods of analysis]. (Eds. Yu.A. Zolotov) Moscow: Vysshaia shkola [in Russian].

5 Golbert, K.A., & Vigdergauz, M.S. (1990). Vvedenie v hazovuiu khromatohrafiiu [Introduction to Gas Chromatography]. Moscow: Khimiia [in Russian].

ОПТИМИЗАЦИЯ ПРОЦЕССА «ХОЛОДНОГО ОТВЕРЖДЕНИЯ» ПОЛИЭТИЛЕНГЛИКОЛЬМАЛЕИНАТА С АКРИЛОВОЙ КИСЛОТОЙ В ПРИСУТСТВИИ ДВУХКОМПОНЕНТНОЙ ИНИЦИИРУЮЩЕЙ СИСТЕМЫ

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Инициирование реакции полимеризации включает в себя применение специальных веществ, при распаде которых образуются радикалы, зарождающие цепь.Многообразие инициаторов вызвано тем, что использование каждого из них позволяет получать полимер с различной молекулярной массой с сохранением оптимальных условий работы реакторов.В последнее время в качестве инициаторов применяют смеси двух и более различных по строению и активности соединений, одним из которых является пероксид. Стоит отметить, что правильно подобранная инициирующая система позволяет получить оптимальные значения времени полимеризации и выхода продукта, а также качественные показатели полимера, в частности физико-химических и механических свойств, что особенно важно при их непосредственной эксплуатации.

Одной из востребованных областей применения полимерных материалов является стройиндустрия, где они представлены в виде адгезивов – герметиков и клеев отверждаемого типа. Поэтому весьма желательным представляется достаточно быстрое отверждение герметизирующего состава при невысоких температурах. При этом время и температура отверждения должны быть оптимальными в зависимости от области эксплуатации продукта. Регулирование параметров процесса отверждения (времени, температуры) в случае ненасыщенных полиэфиров и получение сополимеров с оптимальными