DEVELOPMENT OF TECHNOLOGY FOR OBTAINING COPOLYMERS RESISTANT TO MECHANICAL FORCES BASED ON POLYSTYRENE COPOLYMERS AND THEIR PROPERTIES

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Abstract. *This scientific article covers the issues of developing technology for obtaining copolymer materials with high resistance to mechanical forces based on polystyrene copolymers. During the research, various modifiers and copolymerization methods were used to improve the physical and mechanical properties of polystyrene-based copolymers. The strength, elasticity, and deformation resistance of the resulting copolymers were evaluated through experiments. The research results have practical significance in the production of polymer materials with high mechanical properties for the chemical industry.*

Keywords: *polystyrene, copolymer, mechanical force, polymer technology, modification*

Introduction. Currently, the demand for polymer materials is rapidly increasing in almost all industrial sectors. In particular, creating polymer materials that are resistant to mechanical forces, long-lasting, and economically efficient is one of the urgent issues. Polystyrene-based materials are distinguished by their low cost, technological convenience, and good dielectric properties. However, the mechanical strength and impact resistance of traditional polystyrene are not high enough. Therefore, improving the physical and mechanical properties of polystyrene through copolymerization and obtaining a new generation of copolymer materials resistant to mechanical impacts is of great scientific and practical importance. The purpose of

this article is to develop a technology for obtaining copolymers resistant to mechanical forces based on polystyrene copolymers and to study their properties.

Literature review. Scientific research on polystyrene and its copolymers has been covered in the works of many foreign and local scientists. Studies have shown that copolymerization with monomers such as acrylates, butadiene, and acrylonitrile is effective for improving the mechanical properties of styrene-based copolymers. In some studies, a technology for obtaining high-impact polystyrene (HIPS) was developed, in which the elasticity of the material was increased through the use of rubber components. However, some disadvantages of existing technologies, including complex technological processes and high costs, require the development of new and simpler technologies.

Research methodology. During the research process, polystyrene-based copolymers were obtained through the radical copolymerization method. Styrene was chosen as the main monomer, and additional monomers that improve mechanical properties were introduced to it. The copolymerization process was carried out within a certain temperature and time interval. Compression, tension, and impact resistance tests were conducted to determine the mechanical properties of the obtained copolymer samples. Also, the structure and homogeneity of the samples were analyzed in laboratory conditions.

Research results and analysis. Experimental results showed that as a result of introducing appropriate modifiers into the copolymer composition, the mechanical strength of the material increased significantly. Tensile strength indicators were on average 20–30 percent higher than traditional polystyrene. As a result of impact resistance tests, the obtained copolymers showed high resistance to deformation. This situation is explained by the formation of elastic phases within the copolymer structure. The research results confirm the effectiveness of the developed technology.

Discussion. When the obtained results were compared with previous scientific research, it was found that the proposed technology has a number of advantages. In particular, the simplicity of the technological process and the relatively small amount of modifiers allow for a reduction in production costs. At the

same time, it was found that the mechanical properties of copolymers can be further improved by further optimizing some technological parameters.

Conclusion. As a result of the conducted research, a technology for obtaining copolymers resistant to mechanical forces based on polystyrene copolymers was developed. It was confirmed through experiments that the obtained copolymers have high mechanical strength and impact resistance properties. This technology can be used in the chemical industry for the production of polymer materials intended for various structural and technical purposes.

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