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# Synthesis of new copolymers based on 2,3,4,5,6-pentafluorostyrene, styrene, α-methylstyrene and 4-fluoro-α-methylstyrene

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**Abstract**

At the first stages of the research work, a copolymer of styrene and α methyl styrene was synthesized by the method of radical emulsion polymerization in an inert atmosphere of argon. The initiator was ammonium persulfate. The molar ratio of the initial monomers of styrene and α-methylstyrene was 70 : 30, respectively. It was found that copolymers synthesized under special controlled conditions have good values of permittivity and dielectric loss tangent. It should be noted that the choice of emulsifier directly affects the values of these indicators. It was previously shown that the most optimal emulsifier is potassium stearate, using which the best values of the dielectric constant and dielectric loss tangent were achieved. At the second stage of the research work, a number of copolymers were synthesized containing 4-methoxystyrene, 4 methyl styrene and α-methyl styrene in their structure. It was experimentally confirmed that the synthesis procedure may be applicable for the preparation of copolymers based on derivatives of styrene and α-methylstyrene. The resulting series of copolymers is highly soluble in methylene chloride; films of each copolymer sample of different thicknesses were obtained by casting from a solution. For this series of copolymer films, the dielectric constant and dielectric loss tangent were determined. It was found that the best values of permittivity and dielectric loss tangent are possessed by a sample of copolymer 4-methoxystyrene and α-methylstyrene. At the latest stage of the study, copolymers of styrene and 2,3,4,5,6-pentafluorostyrene, α-methylstyrene and 4-fluoro-α-methylstyrene, 2,3,4,5,6-pentafluorostyrene and 4-fluoro-α-methylstyrene were synthesized. These fluorine-containing derivatives of styrene and α-methylstyrene easily enough enter into the reaction of radical emulsion copolymerization. The copolymer yields are 53-76%, calculated on the weight of the starting monomers. The structure of a number of newly synthesized copolymers was confirmed by IR spectroscopy. In the future, it is planned to define the values of dielectric constant and dielectric loss tangent for these copolymer samples. It is planned to study the thermomechanical properties of the samples, since fluorine-containing polymers are a promising material for operation at elevated temperatures.

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