

## Preparation of styrene – $\alpha$ -methylstyrene copolymer using various anionic and non-ionic emulsifiers

© Ignat S. Dolgin, Yury P. Zarubin, and Pyotr P. Purygin\*<sup>+</sup>

Department of Organic, Bioorganic and Medicinal Chemistry. Samara National Research University.

Moskovskoe Ave., 34. Samara, 443086. Samara Region. Russia.

Phone: +7 (846) 334-54-59. E-mail: [puryginpp2002@mail.ru](mailto:puryginpp2002@mail.ru)

\*Supervising author; <sup>+</sup>Corresponding author

**Keywords:** emulsion copolymerization, styrene,  $\alpha$ -methylstyrene, anionic emulsifiers, nonionic emulsifiers, copolymer.

### Abstract

A styrene- $\alpha$ -methylstyrene copolymer was prepared by emulsion copolymerization in the presence of an initiator of ammonium persulfate and various emulsifiers at a weight ratio of the starting monomers of 70:30. As ionic agents (sodium oleate, potassium stearate oleate, a mixture of oleate and potassium stearate) as emulsifiers, and non-ionic emulsifiers (OS-25 and OS-50). The yields of the copolymer in the case of using ionic emulsifiers were 74-85%, the maximum yield being observed only when using a mixture of oleate and potassium stearate (1:1). When non-ionic emulsifiers OS-25 and OS-50 were used, the yields of the copolymer were 75-90%, the greatest yield was obtained using the OS-50 emulsifier. The molar ratio of styrene to  $\alpha$ -methylstyrene, determined by <sup>1</sup>H NMR spectroscopy, was 8:3. IR spectroscopy showed that the copolymer of styrene and  $\alpha$ -methylstyrene obtained using potassium stearate had minimal residual amounts of emulsifier due to its low adsorption obtained copolymer. In the case of the use of sodium or potassium oleates and their mixture, very weak characteristic frequency bands are characteristic of the carboxyl group of emulsifier molecules, which indicates their inclusion in the synthesized polymer chains as comonomers. In the case of non-ionic OS-25 and OS-50 emulsifiers, the copolymer cannot be washed from them, despite the fact that the emulsifier molecules are not covalently bound to the copolymer. The good adsorption of emulsifier molecules on the hydrophobic surface of the copolymer is due to the presence of hydrophobic alkyl and ethylenic fragments in the structures of the molecules of these emulsifiers and the inability to ionize terminal OH groups under normal conditions.

### References

- [1] Modern styrenic polymers: polystyrenes and styrenic copolymers. Edited by John Scheirs and Duane B. Priddy. *John Wiley & Sons, Ltd.* **2003**. 744p.
- [2] D. Paul, C. Newman. Polymer mixtures. edited by D. Paul, S. Newman. V.1. *Moscow: Mir.* **1981**. 541p. (russian)
- [3] G.I. Sultanova, G.A. Sayfetdinova, A.P. Rakhmatullina, R.A. Ahmed'yanova, A.G. Liakumovich. Effect of potassium salts of stearic and oleic acids on the emulsion copolymerization of styrene and  $\alpha$ -methylstyrene. *Bulletin of Kazan Technological University.* **2006**. No.2. P.67-71. (russian)