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THE NEW REAGENT PREVENTING EVAPORATION OF OİL AND OF OIL PRODUCTS

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This paper presents the results of a study of the synthesis of polymers of butyl methacrylate with styrene and their use as a reagent that prevents evaporation of oil and petroleum products during storage, transfer from one tank to another, and transportation. Comparative studies of the classical reagent showed a significant advantage of the first, which should be explained by the structural composition of the polymers.

Keywords: *butyl methacrylate, styrene, copolymerization, reagent, oil, oil products, evaporation*

Evaporation of slight fraction occurs during storage of oil and oil products in on soil tanks and as well as their transportation and besides pollution of environment, it cause to considerable economic losses too. Polymer type superficial active substances are used for prevention of this event. These substances are not solved in the oil and oil products, but make thin cover on them and it prevents evaporation. Butadiene-styrene and acrylonytrile copolymers (БС, БС – ГП-65 and БСНК latexes) are known for elimination of evaporation [1]. But because of certain reasons, the mentioned polymers have not been widely applied and therefore the investigations are continued in this direction. Synthesized polymers and copolymers of butyl methacrylates are investigated as reagents for preventing evaporation of oil [2, 3]. As the continuation of this idea, besides butyl methacrylate-styrene copolymers were used too as superficial active substances against evaporation.

It is necessary to state that interest in any chemical product is determined by its raw material reserves. Differing from other methacrylate, butyl methacrylate is not expensive and found easily, it has production. Butyl methacrylate is made of repetitive etherification reaction of methacrylate and butyl alcohol and characterized by the following physical stables: molecular mass 142, boiling temperature 163^0C/760 mm m.c., it is colorless fluid not soluble in water.

Styrene is one of the cheapest raw materials of oil-chemistry industry and obtained from alkalization of benzyl with ethyl and characterized by the following physical stables: molecular mass 104, melting temperature $30,6^0$C, boiling $145,2^0$C/760mm m.c., it is trembling fluid easily polymerized while leaving. Inhibitor (hydroquinone) is added in order to prevent polymerization; it is cleaned out by alkali solution during utilization.

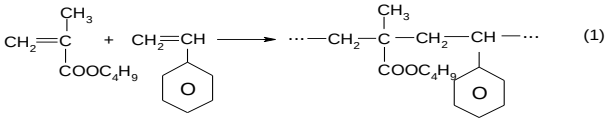
Copolymerization of Butyl methacrylate (BMAC) together with styrene (St) was implemented at 60-70^0C temperature with the participation of initiator (azo (bis) isooil acid dinitrile) in toluene solution. The influence of different factors on the process, as well as of temperature, initiator and monomer mixtures in toluene, their ratio with monomer and other factors have been investigated.

It was determined that changing of the amount of styrene in the mixture of initial monomers in the limit of 5-30% caused to increase of outlet and molecular mass. It is explained by the fact that styrene is polymerized quickly upon radical mechanism. From other side, as the vinyl groups in monomer pairs involved in copolymerization are encircled by replacers of different nature, the polymerization process becomes easier. In this case (from 95% to 97.5%) the value of the molecular mass increases from 18000 to 25000. Copolymerization is implemented at 70^0C, monomer mixture: toluene in the ratio of 1:1 and BMAC in the ratio of 90:10.

Increase of the initiator expenditures causes to decrease of the molecular mass and increase of outlet. It is peculiar for radical polymerization. Thus, the number of active centers causing to polymerization increases by increase of the amount of initiator.

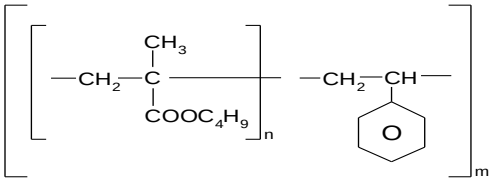
Study of the influence of other factors as temperature and toluene on the process shows that implementation of copolymerization in the level of 60-70^{0}C, at 50% toluene solution contributes to obtaining joint polymerization having necessary molecular mass and outlet.

It is possible to write the implemented reaction schematically as following:


(1)

Structure and composition of copolymer has been investigated via IR- and PMR-spectroscopy. On the IR-spectrum, the presence of the 1600 sm^{-1} absorption band characterizes the styrene fragment and 1720 sm^{-1} – the methacryl fragment. Absorption bands corresponding to –CH_2– groups (700–720 cm^{-1}) and CH_3 groups (1385 cm^{-1}) are also found in the spectrum. On the NMR- spectrum detected signals of 6.7, 0.9 and 1.1 ppm, corresponding to both monomers. It was determined that of the monomers mangas obtain alternating real copolymers.

According to the results of the implemented investigation work the following general formula may be suggested for synthesized copolymer:


(2)

here in = 8-17, m = 28-50

Butyl methacrylate-styrene copolymer has been studies as a reagent as following: 2% solution of copolymers having molecular mass (14-25) 10^3 in toluene is prepared. Heptane is used as oil product. The samples are added to heptane (100 ml) in 1 ml amount. Simultaneously, an empty practice (without reagent) is put. The experiences are held at 20, 25 and 30^{0}C temperatures. After some time, the samples are weighted with 0.01 g exactness and the mass loss in the oil product is appointed

$$S_1 = \left(1 - \frac{P}{P_0}\right) \cdot 100\% \qquad (3)$$

here in P and P_0 – accordingly is decrease of the oil product weight with and without reagent, g.

The results of the experiences are shown in the table.

Table

Results of the study of BMAC-St copolymer in evaporation of heptane

Temperature, ^{0}C	Decrease of evaporation depending on time (hour), %				
	3	6	9	12	24
MOLECULAR MASS OF COPOLYMER M = 14000					
20	89	87	85	83	80
25	87	85	83	82	79
30	85	84	82	80	78
Molecular mass of copolymer M = 17000					
20	90	88	87	85	83
25	88	86	86	84	82
30	86	84	83	82	81
Molecular mass of copolymer M = 25000					
20	92	90	89	87	85
25	91	89	87	85	83
30	89	87	85	82	80
Synthetic latex					
-	69	65	62	60	57

As it is seen from the numbers indicated in the table, increase of the molecular mass causes to increase of its efficiency. It is clear, thus increase of the value of molecular mass causes to formation of strong protecting cover and in the result evaporation of the oil products is prevented more rationally. As the evaporation becomes quicker by increasing temperature, the efficiency of the reagent shows itself in the upper temperatures.

For the comparison, numbers for synthetic used for this purpose were used and it was determined that investigated new sample has superiority on the reagent.

If the synthetic latex decreases the evaporation of oil products for 57-69%, then the suggested reagent eliminates evaporation for 80-89%.

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NEFT VƏ NEFT MƏHSULLARININ BUXARLANMASININ QARŞISINI ALAN YENİ REAGENT

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Məqalədə butilmetakrilatın stirolla birgə polimerinin sintezi, həmçinin neft və neft məhsullarının buxarlanmasının qarşısını alan reagent kimi tətbiq edilməsinin tədqiqinin nəticələri verilmişdir. Yeni reagentin klassik reagentlərlə müqayisəli tədqiqi onun xeyli üstün olduğunu göstərmişdir ki, bu da birgə polimerin strukrur tərkibi ilə izah olunur.

Açar sözlər: butilmetakrilat, stirol, birgə polimerləşmə, reagent, neft, neft məhsulları, buxarlanma

НОВЫЙ РЕАГЕНТ, ПРЕДОТВРАЩАЮЩИЙ ИСПАРЕНИЯ НЕФТИ И НЕФТЕПРОДУКТОВ

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В данной работе представлены результаты исследования синтеза сополимеров бутилметакрилата со стиролом и применения их в качестве реагента, предотвращающего испарения нефти и нефтепродуктов при хранении, перекачке из одного резервуара в другой и транспортировке. Сравнительные исследования нового реагента с классическими показали значительное преимущество первого, что следует объяснить структурным составом полимеров.

Ключевые слова: бутилметакрилат, стирол, сополимеризация, реагент, нефть, нефтепродукты, испарение