

# PRODUCTION OF DIESEL FUELS WITH IMPROVED LOW-TEMPERATURE PROPERTIES WITH DEPRESSOR ADDITIVES SYNTHESIZED ON THE BASIS OF HETEROCYCLIC ETHERS OF ACRYLIC ACIDS

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**Abstract:** the economic development of industrially developed countries, including Uzbekistan, is inseparably linked with the development of the fuel and energy complex. For wider use of complex products and increasing demand, it is necessary to adapt it for use in rapidly changing climatic conditions. For this, it is necessary to change the physicochemical properties of the diesel fuels already produced, adapting them to different natural conditions of use. In connection with the increase in the volume and distribution of the use of diesel fuel of one type of product, the question arises not only about its impact on the environment, but also on the search for new ways of obtaining and improving its physicochemical properties based on the use of Local raw materials, which increases its economic application In various fields of activity, replacing expensive imported products. One way to change the low-temperature properties of fuel is the addition of so-called depressants. The purpose of this work is to develop a technology for the production and use of qualitatively new, imported-substituted depressant additives synthesized on the basis of local raw materials, which increases their economic efficiency [1, 2].

Synthesized depressor additives based on heterocyclic compounds of acrylic acids, such as benzoxazolone, benzoxazolethione, benzothiazolone, benzothiazolethione. Polymers are used as depressor additives, when introduced in small amounts of diesel fuels, which leads to a significant reduction in the pour point and an improvement in fluidity at low temperatures. Is investigated structurally - mechanical properties on a basis by polymeric compositions polyvinyl of spirit. The degree of fixing depends as on quantity(amount) of a printed paint, passing to a fabric, and from depth penetration in a fabric. Than the more printed paint passes to a fabric and the more deeply she(it) will penetrate in depth of a fabric, the above expected meaning(importance) of a degree of fixing. Synthesis of depressant additives on the basis of waste low molecular weight polyethylene and partially hydrolyzed polyacrylonitrile. Preparation of graft copolymers of polyethylene alkylated product hydrolyzed polyacrylonitrile, improves operational properties of petroleum reduced their consumption. When introducing additives physico-chemical and technological properties of diesel fuels fully meet the state standards.

**Keywords:** synthesis, a monomer, a polymer, depressant additives, climatic conditions.

## ПОЛУЧЕНИЕ ДИЗЕЛЬНЫХ ТОПЛИВ С УЛУЧШЕННЫМИ НИЗКОТЕМПЕРАТУРНЫМИ СВОЙСТВАМИ С ДЕПРЕССОРНЫМИ ПРИСАДКАМИ СИНТЕЗИРОВАННЫХ НА ОСНОВЕ ГЕТЕРОЦИКЛИЧЕСКИХ ЭФИРОВ АКРИЛОВЫХ КИСЛОТ

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**Аннотация:** Экономическое развитие промышленно развитых государств, в том числе Узбекистана, неразрывно связано с развитием топливно-энергетического комплекса. Для более широкого применения продукции комплекса и увеличения спроса необходимо ее приспособить для применения в резко меняющихся климатических условиях. Для этого надо изменить физико-химические свойства уже выпускаемых дизельных топлив, приспособивая их к разнообразным природным условиям применения. В связи с увеличением объёма выпуска и распространения области использования дизельного топлива - одного из видов продукции - возникает вопрос не только о его влиянии на окружающую среду, но и поиск новых путей получения и улучшения его физико-химические свойства на основе использования местного сырья, что повышает его экономичность применению в различных сферах деятельности, заменяя дорогостоящую импортную продукцию.

Одним из способов изменения низкотемпературных свойств топлива является добавка в него так называемых депрессорных присадок. Целью данной работы является разработка технологии получения и применения качественно новых, импортнозамещённых депрессорных присадок, синтезированных на основе использования местного сырья, что повышает их экономичность [1, 2].

Синтезированы депрессорные присадки на основе гетероциклических соединений акриловой кислоты, таких как бензоксазолон, бензоксазолтион, бензтиазолон, бензтиазолтион. Полимеры использованы в качестве депрессорных присадок, введение которых в малых количествах в дизельные топлива приводит к существенному снижению температуры застывания и улучшению текучести при низких температурах. Синтез депрессорных присадок на основе отходов низкомолекулярного полиэтилена и частично гидролизованного полиакрилонитрила. Полученные привитые сополимеры полиэтилена с алкилированным продуктом гидролизованного полиакрилонитрила улучшают эксплуатационные свойства нефтепродуктов, снижется их расход. При введении присадок физико-химические и технологические свойства дизельных топлив полностью отвечают государственным стандартам.

**Ключевые слова:** синтез, мономер, полимер, депрессорные присадки, климатические условия.

The main waste of polyethylene production is a mixture of ethylene-containing gases, paraffin hydrocarbons, cyclohexane containing low molecular weight polyethylene, and petroleum products - an oil sump of an alkaline column, the so-called yellow oil.

The use of depressant additives is one of the most effective ways to improve the low-temperature properties of diesel fuels. Polymers and copolymers are effectively used as depressant additives for diesel fuels. The introduction of depressant additives in small amounts leads to a significant reduction in the pour point of diesel fuel and a decrease in its viscosity at low temperatures. The development of depressant additives based on cheap and affordable raw materials, characterized by good viscosity-temperature properties, is an urgent task.

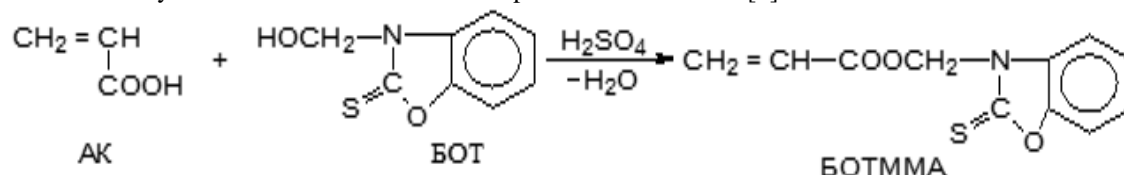
In this regard, the actual development of effective additives is preserved, which, in addition to the quality indicators, allow to increase the economic efficiency of the obtained oil products.

We have received additives based on the waste of heterocyclic polyethylene polysilicate compounds, such as benzoxazolone (BOO), benzoxazolethione (BOT), benzothiazolone (BTO), benzothiazoleton (BTT). Heterocyclic esters of acrylic acids (GEAAC) were prepared by reacting alkali metal salts of acrylic acids with halogenmethyl derivatives of nitrogen, oxygen, halogen and sulfur-containing heterocyclic compounds in a benzene medium at a temperature of 60-80 °C [2].

In this regard, the actual development of effective additives is preserved, which, in addition to the quality indicators, allow to increase the economic efficiency of the obtained oil products.

We synthesized polyacrylate depressor additives based on heterocyclic compounds such as benzoxazolone (BOO), benzothiazolone (BTO), benzoxazolethione (BOT), benzothiazoleton (BTT).

Synthesized heterocyclic esters of acrylic acids (HEAC) by the interaction of acrylic acids with hydroxymethyl derivatives of nitrogen, oxygen and sulfur-containing heterocyclic compounds in the presence of a sulfuric acid catalyst in a benzene medium at a temperature of 60-80 °C [3].



To carry out the esterification and shift the equilibrium reaction toward the formation of the ester, the water was removed by boiling the reaction medium with the addition of a water-moistening benzene agent. The process of esterification due to the high activity of the heterocyclic ester forming acrylic acid (GEAC) is accompanied by polymerization, which reduces the yield of the desired product. By adding 1.0% hydroquinone to the reaction medium, the yield of the monomeric product can be increased by 15-20%.

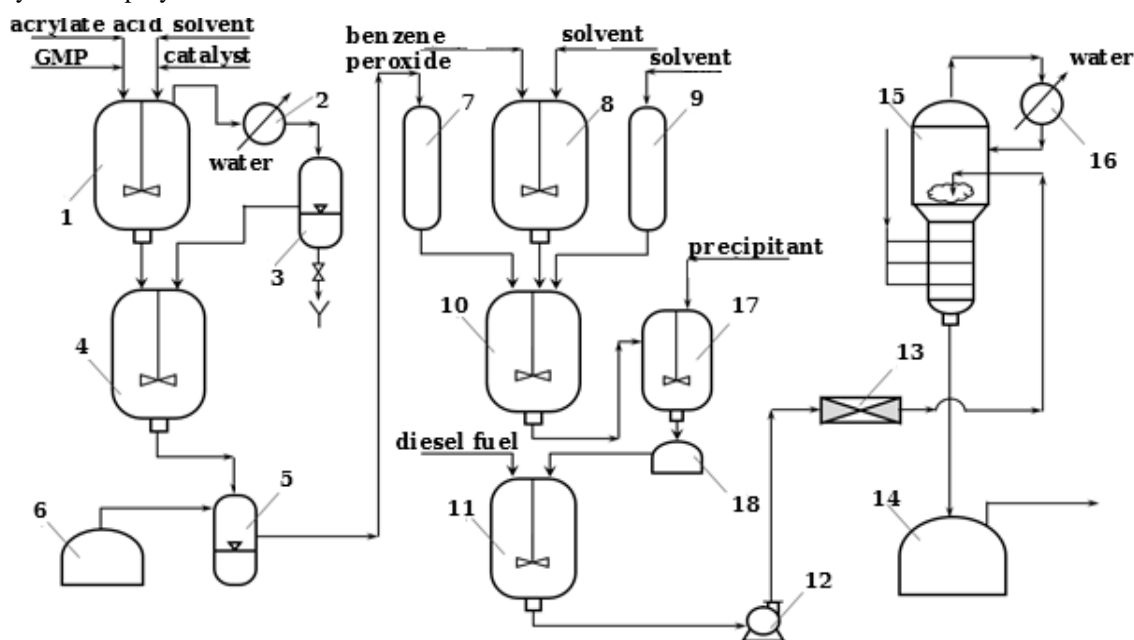
All synthesized monomers identified by liquid chromatography are colorless crystalline materials that are readily soluble in many organic solvents.

The resulting polymers having depressant properties, when added to diesel fuel, improve their physicochemical and mechanical properties and fully meet the requirements of the standard, have improved low temperature characteristics such as pour point and cloud point. Also, the structure of diesel fuels without and with a composite depressant additive studied under a microscope, apparently (shown), it is a continuous grid consisting of small needles with large crystalline conglomerates interspersed in it with a size of 0.05-0.10 microns.

A great influence on the temperature of the solidification of the fuel is the rate of cooling, namely: with the increase of the latter, their pour point increases due to the appearance of a large number of crystallization centers uniformly distributed throughout the volume and contributing to the creation of a stronger structure. To add composite depressant additives is necessary at a temperature above the turbidity of the fuel, it is optimal that the temperature be + 10 ° C. Compliance with this condition will ensure the best results [3-4].

Synthesis of polyacrylate additives (PAPS) consists of two main stages: esterification of acrylic acid with heterocyclic compounds of hydroxymethyl derivatives. As reagents, hydroxymethyl derivatives of hydroxymethylbenzoxazolone, hydroxymethylbenzoxazolethione, hydroxymethylbenzothiazolone, hydroxymethylbenzothiazolethione, acrylic acid, solvent, sulfuric acid (as catalyst), aqueous ammonia solution, benzoyl peroxide (initiator) and diluent were obtained as reagents. The method for producing polyacrylates is carried out as follows: hydroxymethyl derivatives of heterocyclic compounds, acrylic acid, solvent, sulfuric acid are introduced into the esterification apparatus (1) in portions. The esterification process is carried out at atmospheric pressure, heating and continuous mixing. The water vapor formed during the reaction is removed from the device (1) together with the solvent vapor and fed through the cooler (2) to the water separator (3). The degree of conversion of raw materials to acrylate is 95 - 97%. The flow chart of this process is shown in Figure 1.

The product containing a mixture of acrylates, unreacted feedstock components, catalyst and solvent is continuously fed to the neutralizer (4) to neutralize with aqueous ammonia solution. The mixture of neutral product and process water flows into the filter separator (5) by gravity to separate from the washing water, additional washing of the monomer. The purified product is collected in the dryer (7), and the washing water enters the vessel (6) for further use. Neutral acrylates serve as raw materials for the second main stage of synthesis - polymerization.



1 - etherificator; 2, 16 - condenser; 3 - water separator; 4 - neutralizer; 5 - separator; 6, 14, 19 - collectors; 7, 9 - batchers; 8, 11 - mixer; 10 - polymerizer; 12 - pump; 13 - filter; 15 - vaporator; 17 - precipitator.

Fig. 1. Technology of polymethacrylate depressants

The polymerization reaction of the acrylates is carried out continuously in the apparatus (5) in the presence of a benzoylperoxide initiator and a solvent. The resulting polymer enters the precipitator from the reaction mixture with isopropanol, then filtered in a filter and dried to a constant weight. Then, the pressure reducing agent continuously enters the mixer (7) where the diesel fuel is loaded in an amount providing 60-70% of the polymer concentrates in the fuel for the commercial additives. The influence of the nature of the synthesized depressant additives on the pour point of diesel fuel Dts 989: 20 01 is studied. It is obvious that PBCO reduces the pour point of diesel fuel by 14 ° C, PBO at 16 ° C, PBTO at 17 ° C, PBTT at 19 ° C, respectively . An evaluation of

GEAAC depressor activity showed that it increases with increasing polar groups in the heterocyclic compound. To study the depressor properties of synthesized heterocyclic esters of polyacrylic acids (HEPAC), the physicochemical properties of diesel fuel have been studied [5]. The physico-chemical and mechanical properties of diesel fuels fully meet the requirements of the standard and have improved low-temperature characteristics, such as pour point and cloud point.

Thus, polyacrylate depressant additives, when introduced in small amounts (0.1-1.0%), lead to a significant reduction in the pour point and an improvement in fluidity at low temperatures.

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