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ANALYSIS OF DEMULSIFIER PRODUCTION FROM SULFURIZED COTTONSEED OIL AND BREAKDOWN OF WATER-OIL EMULSIONS

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Abstract

This article presents the synthesis of a demulsifier based on the secondary raw materials of the domestic oil industry for breaking down water-oil emulsions of high-viscosity heavy oils. Demulsifier is obtained by sulphuring cotton oil obtained by extraction method with sulfuric acid and treating the obtained component with sodium hydroxide. The process of breaking up emulsions of high-viscosity oils with synthesized demulsifier and previously known demulsifiers was analyzed.

Keywords: *water-oil emulsion, complex emulsion, dehydration, desalination, deemulgator, heavy oil, high-viscosity oil, composition*

Introduction

The decomposition of water-oil emulsions (WOE) of high-sulfur heavy oils involves the implementation of processes such as water drop approaches and their coalesences, which cause the interphasic protective shells of water globules to decompose. In the coalescence of water droplets, their dimensions increase sufficiently to sink to the bottom of the structure.

In existing technologies, a number of processes of dehydration and desalination of oil are used. The choice of one or another method of oil dehydration will depend on the productivity of operation of the devices, the quality and quantity of layer waters, the effectiveness of deemulging.

Most often, the layer water is contained in petroleum raw materials, and in some cases it is in a free state, that is, it is not dispersed. Such water is separated from oil by immersion.

Research method

Modern deemulgators, as a rule, are chemicals obtained with a complex multi-stage synthesis. Approximately one-third of deemulgators are designed to break down the following types of WOE:"oil in water" and "water in oil", which is formed in the method of pumping water into oil fields and under the conditions of applying various methods of affecting the layer. While deemulgators decompose WOE, requirements related to the ingestion of emulsions of corrosion in metals are also imposed.

In order to obtain surfactants with the greatest deemulgating activity, optimal proportions of polyoxyethylene chain and hydrophobic radical must be achieved. In the synthesis of noionogenic surfactants, the number of groups of ethylene oxide and propylene oxide changes in the form of blocksopolymers, and thus, based on their properties, the ratio between the hydrophobic and hydrophilic parts of the deemulgator is easily regulated.

For the synthesis of oxyethylated fatty acids with a number of carbon atoms of more than 20, fatty acids and gudrons in cubic residues of oil and oil enterprises are used. The decomposition efficiency and physical properties of these deemulgators (solid temperature, viscosity, density) will depend on the oxyethylenated group of each fatty acid with carbon number C_{14}– C_{25}.

Effective deemulgators are synthesized with C_{25} based on fatty acid with 65–67% ethylene oxide. In terms of deemulgirating efficiency of stationary WOE, it is not inferior to imported Dissolvan.

Oxytylated alkylphenols are known to be the oxytylation products of mono-and dialkylphenols.

According to polyoxyalkylene block-sopolimers, the most effective and universal deemulgator and their high deemulgating activity are related to appearance, the hydrophobic part of the surfactants is not directed to the depth of the oil phase, like typical deemulgators, and the partial emulsion phases are spread over the surface. This contributes to the low consumption of deemulgators (30 g/t).

Results

The history of the synthesis of deemulgators consists of several stages: as deemulgators, inorganic products (iron powder, sodium carbonate, mineral acids, etc.), alkaline salts of carboxylic and naphthenic acids, neutralization products began to use oxidized paraffin or gazoyl. In addition, deemulgators containing sulfogroup–SO_2OH or sulfate group–OSO_2OH were developed.

The use of the sodium salt of sulfurized castor oil as a deemulgator the results of the deemulgating properties of sulfurized surfactants have provided the impetus for extensive research. For these purposes, various high – molecular unsaturated fatty acids and oxycislotes, as well as their derivatives-esters or alkylated amides, as well as natural acid glycerides, undergo sulfiration. In addition, many deemulgators were obtained by sulfirating alkylated aromatic hydrocarbons, with subsequent elimination or etherification of the sulfoic acids obtained.

Demulsifiers, in addition to high surface activity, should have a wetting and dispersing effect, especially for asphalt-resin substances. The "effective" concentration of demulsifiers, depending on the ratio of their polar and non-polar parts, determines their hydrophilic-lipophilic balance (HLB). The maximum demulsifying properties of solutions of nonionic surfactants are manifested in the area of their micelle-forming concentrations, in which aqueous solutions of surfactants have high washing and wetting properties.

Fatty amines react with the active groups of the emulsifier on the surface of the phases, and fatty alcohols of medium chain length destabilize the emulsion by diffusion and redistribution of their molecules in the boundary layers. Therefore, a mixture of fatty Amine and fatty alcohol indicates the maximum deemulgirating ability, since "acid – Amine" charged complexes are formed on the surface of the compartment, the film is hydrophilic and cannot stabilize the water oil emulsion.

Authors some specific laws of interphasic distribution of noionogenic surfactants have been identified.

After the decomposition of the emulsion in the aqueous phase, regardless of the total amount of surfactants included in the emulsion (release rate), the stability of the transition share in the initial emulsion over a wide range of dispersed water content was determined.

In research work when the structure of surfactants is studied its effect on the ability to deemulge, the effect of deemulge water oil emulsions will not only depend on the structure, but also depend on the position of the functional groups and the value of the GLM. For example, the ability to deemulge nonionogenic surfactants synthesized on the basis of fatty acids directly depends on their molecular weight and the length of the ethylene oxide chain. Polyglycerides of fatty acids and the above-mentioned ionogenic surfactants are inferior to polyglycol esters of fatty acids, alcohols and alkylamides in their ability to deemulge. In addition, demulsifiers with a high conditional group number of GLM will have the greatest effectiveness in attenuating stable WOEs.

In practice, import deemulgator Reapon-4V designed at a temperature of no less than 15–17 °C is used to deeply dehydrate and desalinate oils. It contains noionogenic surfactants and 50% active substances, and its consumption will be 30–100 g / t compared to oil (Abdirakhimov I. E., 2021; B. 44).

To dehydrate and desalinate stagnant WOE and oil sludge emulsions (OSE), a composite of 5002–2b-40 simple polyephyr, m-2 high boiling fraction, flotoreagent-oxal t-66 and ethylene glycol and water in a certain structural ratio is proposed.

More than 25 large oil and oil enterprises are successfully operating in Uzbekistan, where cottonseed oil is extracted for technical purposes by the method of extraction with a hydrocarbon solvent. Technical cottonseed oil, along with triacylglyceride, contains gossipol, chlorophyll and their derivatives with certain surfactant properties.

For example, the general formula of gossipol is as follows: $C_{30}H_{30}O_8$ acts as a strong dibasic acid, i.e. polyphenol, in chemical reactions. Gossipol interacts with hydroxide, e.g., NaOH forms "phenolates", which means that sodium gossipolates dissolved in water show the surfactant properties of heavy oils in deemulgating water emulsions.

Figure 1. *The gossipol and alkali reaction is carried out according to the following scheme:*

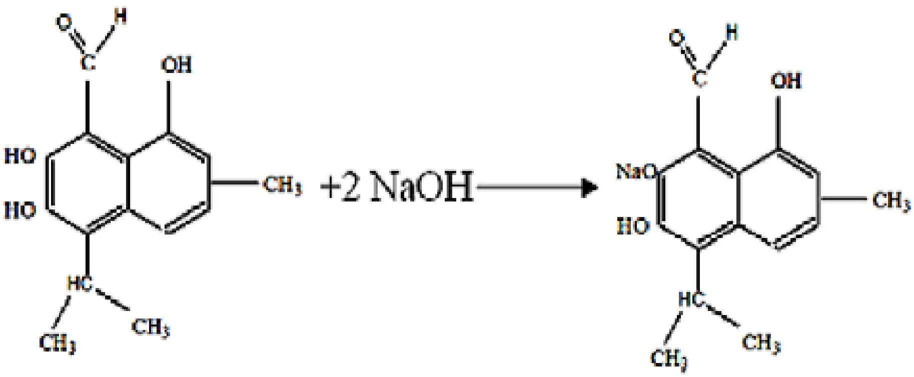
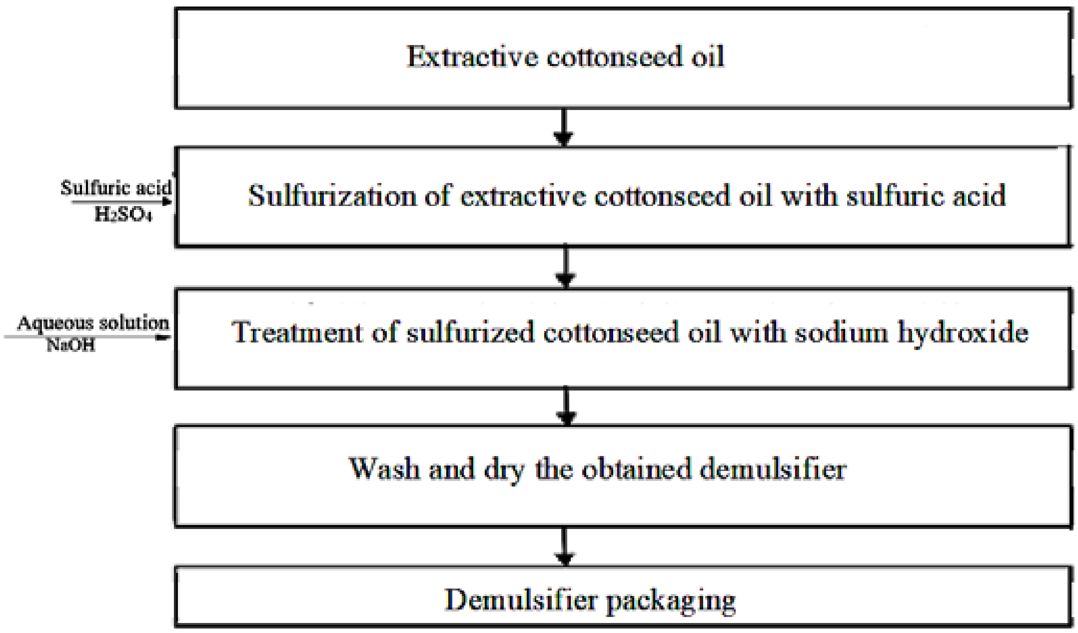


Figure 2. *Scheme for obtaining a deemulgator based on sulfurized cottonseed oil*



As you can see, washing with an alkaline aqueous solution of gossipol, for example, NaOH, allows you to get ionogenic surfactants with good moisturizing and foaming bility.

As you can see, washing with an alkaline aqueous solution of gossipol, for example, NaOH, allows you to get ionogenic surfactants with good moisturizing and foaming bility.

The development of the production of deemulgators is focused on the production of surfactants, which today include sulfoguruh (SO_2OH) or sulfate group – OSO_2OH. Taking this into account, the deemulgators containing the sulfur compounds mentioned above were synthesized on the basis of technical extraction cotton oil. In (Figure 2), a flow scheme is provided to obtain a deemulgator containing a sulfo group.

Conclusion

The extraction of turbidity of cottonseed oil was carried out by treating it with sulfuric acid. Surfactants with sulfide after alkaline treatment have good deemulgatory properties. This high molecular weight can be obtained on the basis of unsaturated fatty acids or oxide acids, as well as using ether or alkylated amides. Basically, many deemulgators are obtained by sulfirating alkylated aromatic hydrocarbons, followed by elimination or esterification of the sulfonic acids obtained.

Table 1. *Indicators of residual water content in the emulsion when using deemulgators K-1 and SD-1, SD-2*

Deemulgator designation	Deemulgator consumption, g/t	Starting water composition,%	Residual water content in the emulsion,%
К-1 (control)	60	31,0	1,5
СД-1	40	30,5	1,0
СД-2	50	30,8	0,9

From Table 1, sulfur-containing deemulgators based on cottonseed oil remove water more deeply than the imported K-1 deemulgator in use. The specific consumption of deemulgator is the main technical and economic indicators of the processes of dehydration and desalination of water emulsions, especially heavy oils.

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