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SELECTION AND USE OF AQUEOUS SOLUTION OF SODIUM SILICATE FOR NEUTRALIZATION OF OIL

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Аннотация
В данной статье представлены результаты исследования процесса очистки в процессе очистки махсарских нефтей в присутствии водного раствора силиката натрия. Установлено, что в этом случае увеличивается выход нейтрализованного масла по сравнению с едким натром. Достигнутые значения качественных показателей нейтрализованного махсарского масла достаточно высоки.

Ключевые слова: сорго, семена, масла, очистка, водный раствор, силикат натрия, соапсток.

Annotation:
V dannoy state predstavleny resultaty issledovaniya protsesa achistki v protsese achistki makssarskikh neftey v prisutstvii vodnogo rastvora silicate natriya. Ustanovleno, chto v etom sluchae uvelichivaetsya vykhod neutralizovannogo masla po sravneniyu s edkim natrom. Dostignutye znacheniya kachestvennyx pokazateley neutralizovannogo maxsarskogo masla dostatochno vysoki.

Keywords: sorghum, semen, masla, chistka, water solution, sodium silicate, soap stock.

Introduction

In the oil production industry of the Republic of Uzbekistan, cottonseed oil obtained by pressing and extraction method is traditionally refined using an aqueous solution of NaOH.

In this case, the concentration of alkali is 200-250 g/l with an excess of 150%. The higher the active alkali (NaOH), the lower the productivity of the product and the higher the loss of neutral oils in the soapstock.

To decolorize dark cottonseed oil, it is necessary to use NaOH, because the extraction of gossypol from cottonseed oil requires the use of an alkali with a high concentration and activity of forming sodium gossypol.

Makhsar oil obtained by pressing and extraction methods has a light color, so it is possible to use alkalis with lower activity, for example, sodium silicate, in their neutralization. In this case, it is necessary to maintain the concentration of sodium silicate aqueous solution at 100-150 g/l with a 50% excess. Therefore, replacement of traditional NaOH alkali with sodium silicate allows to produce more neutralized maksar oil due to saponification of free fatty acids.

Unfortunately, in current practice, because there is no scientific method for neutralizing castor oil with sodium silicate, highly concentrated and excessively alkaline NaOH is still used. Taking this into account, we conducted several experiments on the neutralization of safflower oil using sodium silicate.

The experiments were carried out in laboratory conditions, and the raw material was analyzed based on the manual of neutralized safflower oil (methodology).

Oil neutralization was carried out at a temperature of 60°C, with a mixer rotating at 150 rpm.

Table 1.1 shows the results of extraction and pressing method of neutralization of safflower oil.

Table 1.1 The difference in the final indicators obtained during the neutralization of Makhsar oil with NaOH aqueous solution and sodium silicate

Naming of indicators	Extracted oil	Neutralized oil	
		Aqueous solution of sodium silicate	Aqueous solution of caustic soda (control)
Acid number, mg KOH/g	1,65	0,15	0,28
Mass fraction of phospholipids, %	0,34	0,03	0,09
Color, mg J2	60	20	30
Perekis number, 1/2 ommol/kg	12,05	3,55	4,65
Output, %	-	98,22	95,73

As can be seen from Table 1.1, in the replacement of NaOH with sodium silicate for oil production enterprises, the acid number of maxar oil (from 1.65 mg KOH/mg to 0.15 mg KOH/g, the mass fraction of phospholipids from 0.34%) 0.03%, its color can be reduced from 60 mg J2, the number of peroxides from 12.05 ½ o mol/kg to 3.55 ½ o mol/kg). The achieved quality index of neutralized Makhsar oil is significantly higher.

At the same time, the aqueous solution of sodium silicate increases from 95.73% to 98.22%, i.e. by 2.49%, compared to conventional caustic soda. This is due to the improvement of the selectivity of the process of neutralization of safflower oil when using an aqueous solution of sodium silicate.

Sodium silicate forms a siliceous gel in an aqueous solution with respect to caustic soda, passing the fatty acid with sodium water and triglyceride substances to the soapstock, destroying its traditional composition and rheological properties.

Taking these into account, the known (control) and proposed method (Table 1.2) soap stock composition was analyzed.

Table -2 Comparative indicators of Makhsar soapstocks obtained using sodium silicate and conventional caustic soda (control).

Naming soapstock indicators	Ways to get Maxsar soapstock	
	The proposed method	Conventional method (control)
Total fat content, % as well as: - neutral oil (NYO) - fatty acids (NO) NYO:NONE ratio	49,56 22,86 26,70 0,86	56,84 28,48 28,36 1,01

As can be seen in Table 1.2, the total fat content of soapstock obtained using sodium silicate is less than the total fat content of soapstock color obtained using caustic soda. The advantage of using sodium silicate is that the amount of neutral oil in the soapstock obtained with it is less (22.86%) compared to the neutral oil in the soapstock obtained using caustic soda (28.48%). the same change was observed according to the proposed method (26.7%), according to the traditional method (28.36%).

Analysis of soapstock obtained by the method using sodium silicate can be interpreted as follows: sodium silicate composition n·Na2O·m·SiO2 combines with free fatty acids through the following chemical reaction:

$RCOO^- + Na+ \rightarrow RCOONa.$

In addition, as a bad product, free silicic acids are released, polysilic groups (SiOH), due to their reactivity, they polycondensate with each other and form polysilicic acid in the form of colloidal solutions with various structures (gels). The use of sodium silicate as a neutralizing agent reduces the emulsification of NaOH and results in stable emulsions. Using sodium silicate, it is possible to explain the effectiveness of coloration of safflower oil (table 1.2) by the adsorption of colors that can be dyed with silicate gel of semisilicic acids. The formation of larger particles of soapstock using sodium silicate allows to speed up the process of separation of soapstock from neutralized linseed oil.

Thus, as a result of the conducted research, it is possible to come to the following conclusion:

- The use of sodium silicate instead of traditional caustic soda in the process of neutralization of Makhsar oil increases the selectivity;
- The saponification of triglycerides is reduced and their results are increased, the physico-chemical parameters of the obtained neutralized Makhsar oil are significantly increased, which fully meets the requirements of the relevant standards;
- As a result of the significant expansion of the particles, the process of separation of the soap stock from the neutralized Makhsar oil is enhanced;
- By reducing the emulsifying ability of phospholipids, the amount of neutral oil in the Makhsar soapstock is significantly reduced;
- The ratio of the amount of neutral fat to fatty acids in Makhsar oil is reduced.

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