RESEARCH OF THE PROCESS OF WHITENING COTTON OILS BY DEVELOPED ADSORBENTS

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Annotation: The article presents the results of studying the properties of adsorbents obtained from rice husk. To increase the sorption capacity, the raw material was subjected to heat treatment under various conditions and at different temperatures, and then was used to bleach cotton oils. The amount of added sorbent was from 1 to 4%. According to the results of laboratory tests, adsorbents that have undergone thermal activation at a temperature of 800°C have the highest porosity and bleaching ability. 800°C.
Key words: adsorbent, rice husk, thermal activation, bleaching, cottonseed oil, process efficiency.

1. Introduction

Oils obtained from cotton seeds are dark in color, have a high acid number, and also contain some carcinogenic substances. To improve the quality and nutritional value, the oils are refined.

Unrefined cottonseed oil, toxic due to the presence of gossypol and its derivatives, improves so much in terms of quality that it becomes one of the best in the range of edible oils.

The purpose of refining is to maximize the extraction of associated substances from oils. This process is a complex of various physical and chemical processes through which you can selectively act on related substances and remove them from the oil.

Purification of cottonseed oil under production conditions is carried out in several stages: neutralization of cottonseed oil with an alkali solution, its washing and drying, then sorption bleaching using adsorbents.

The adsorptive refining process is an obligatory stage in the complete refining cycle.

The existing technology of adsorptive refining of cottonseed oil provides for the treatment of bleached oils with various adsorbents after careful neutralization, washing and drying [1, p. 93].

For bleaching cotton oils, special active bleaching clays are often used, obtained from natural bentonite clays, less often - activated carbons, zeolites.

At present, the enterprises of the republic use clays supplied from abroad.

The efficiency of adsorption refining depends on the chemical composition and structure of the adsorbent.

One of the priority directions in the development of modern technology for the production of refined vegetable oils is the creation of new cheap and effective adsorbents.

Objective. The main task for oil and fat enterprises is to increase the quality of the produced oil and products of its processing while reducing their cost, i.e. production costs.

The costs for adsorption refining increase due to the high cost of adsorbents, large losses of oil with the adsorbent. In addition, adsorbents used for bleaching oils are not subjected to regeneration at many oil and fat factories.

The purpose of this work is to study the adsorption properties of activated carbons obtained from rice husks during the bleaching of cottonseed oil.

The developed technology for producing an adsorbent from rice husks differs in that, in order to efficiently oxidize the constituent parts, the rice husks are first treated with hydrogen peroxide, then enriched with a solution of calcium alum. The adsorbent enriched with alum undergoes thermal activation at a temperature of 500 ... 800 ^{0}C without oxygen for two hours.

2. Materials and methods

During the research, the following materials were used:
- cottonseed oil that meets the requirements of TU Uz 816-2001 rev. 2 (Table 1).
- NaOH meeting the requirements of GOST 11078-78;

Table 1

Characteristics of cottonseed oil

Indicator name	Indicators
Acid number, mg KOH	2,6…4,0

Color, (in 1.0 cm cuvette at 70 yellow, red units)	45…59
Moisture, volatile matter%	0,2…0,3
Mechanical impurities,%	0,2…0,4

The color of cottonseed oil was determined using a Lovibond tintometer (method AOCSCc 13e-92) [2, p. 35].
The acid number was determined according to GOST 31933-2012 [3, p. 4] .

Oil absorption of adsorbents was determined by the formula [4, p. 95]: $X = \frac{P_1 - (P_2 + P)}{P} 100$,

(1)

where P1 is the weight of the funnel with filter, clay and absorbed oil, g;
P2 is the weight of the funnel with a filter soaked in oil, g;
R - sorbent weight, g.
The filtering ability of the adsorbents was assessed by the filtration time of a certain amount of oil.
Oil bleaching was carried out in a laboratory unit for adsorption refining using the obtained carbon adsorbents in an amount of 1 ... 4% of the oil mass [5, p.59].
This unit allows bleaching vegetable oils at 70-90 ° C and mixing phases at a speed of 100-150 rpm.

3. Main part

The efficiency of adsorptive refining of vegetable oils depends on such factors as the amount of the bleaching sorbent on the weight of the oil, the temperature and duration of the process, and the pressure in the bleaching apparatus.
The amount of adsorbent for bleaching depends on the quality of the oil (amount of pigments) supplied for processing and ranges from 0.2% to 2%.
In order to study the degree of purification of cottonseed oil obtained by the press method, depending on the amount of adsorbent, a comparative bleaching was carried out in a laboratory unit for adsorption refining.
The amount of added adsorbents obtained at different temperatures of heat treatment [5, p.60] was changed from 1% to 4% by weight of the oil. The process temperature was maintained at about 70 ^{0}C.
The efficiency of the bleaching process was determined by the formula:

$$Э = \frac{C_{нач.} - C_{кон.}}{C_{нач.}} \cdot 100 \qquad (2)$$

The results are shown in Figure 1.

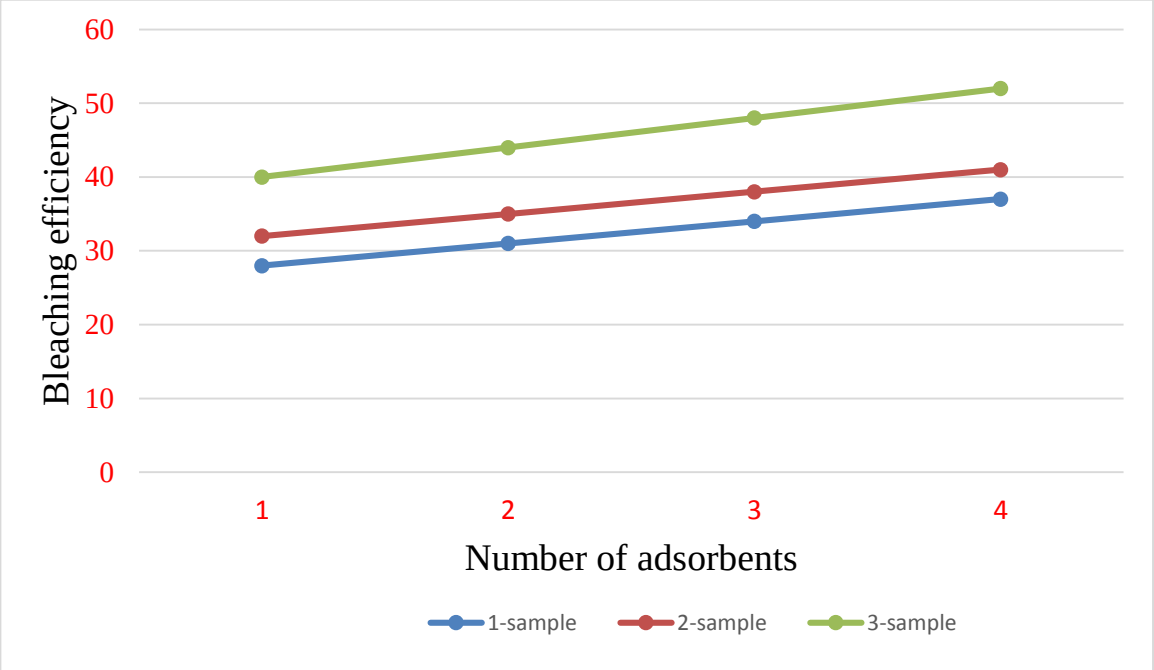

Fig. 1. Influence of the amount of adsorbents obtained at different temperatures of heat treatment on the efficiency of the bleaching process.

The figure shows that with an increase in the amount of introduced adsorbents, the efficiency of the bleaching

process increases. It should be noted that an increase in the temperature of heat treatment of adsorbents has a positive effect on the activity of the adsorbent, leading to a significant increase in the efficiency of the process.

Previous studies have shown that carbon adsorbents obtained by heat treatment at temperatures of 500 ° C and 800 ° C have high porosity, and in terms of adsorption properties they are superior to activated carbon of the BAU brand (Russia).

The use of an adsorbent obtained by thermal activation at 800 ° C, the color of the oil decreases more intensively in comparison with other samples. This means that during thermal activation, an increase in temperature has a positive effect on the activity of the adsorbent.

4. Conclusions

The developed technology for producing an adsorbent from rice husk allows one to obtain adsorbents, the porosity of which increases in comparison with the known activated carbon, which has a positive effect on their sorption properties.

To determine the adsorption properties of the obtained adsorbent, experiments were carried out to bleach cottonseed oil obtained by the press method. According to the results of laboratory tests, it was revealed that the bleaching ability of adsorbents increases depending on the temperature of thermal activation. The highest efficiency of the bleaching process was achieved using an adsorbent obtained by thermal activation at a temperature of 800 ° C.

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