STUDY OF STRUCTURAL-SORPTION CHARACTERISTICS OF ACTIVATED CHARCOAL OBTAINED FROM ARINK SEED SHELLS.

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Abstract. Background of the problem. Bukhara Oil Refinery LLC produces high-quality jet fuel Jet A-1 (kerosene) for the world's most famous companies Boeing, Airbus and local airlines. The kerosene fraction demercaptanization device (BNPP, device No. 12) plays an important role in ensuring that the quality of this fuel meets international standards.

Keywords:, filtration, mulberry, maple, carbanizate, activator, steam generator, regeneration

Annotatsiya. “Buxoro neftni qayta ishlash zavodi” MChJ dunyodagi eng mashhur kompaniyalar — Boeing, Airbus hamda mahalliy aviakompaniyalar uchun yuqori sifatli Jet A-1 (kerosin) aviatsiya yoqilg‘isini ishlab chiqaradi. Mazkur yoqilg‘ining xalqaro standartlarga muvofiqligini ta’minlashda kerosin fraksiyasini demersaptanizatsiya qilish qurilmasi (BNPZ, 12-sonli qurilma) muhim rol o‘ynaydi.

Kalit so‘zlar: filtrlash, tut, zarang, karbonizat, faollashtiruvchi, bug‘ generatori, regeneratsiya

Аннотация. Предыстория проблемы. ООО "Бухарский нефтеперерабатывающий завод" производит высококачественное реактивное топливо Jet A-1 (керосин) для самых известных в мире компаний Boeing, Airbus и местных авиалиний. Устройство для демеркаптанизации керосиновой фракции (BNPP, устройство № 12) играет важную роль в обеспечении соответствия качества этого топлива международным стандартам.

Ключевые слова: фильтрация, шелковица, клен, карбонизация, активатор, парогенератор, регенерация

Introduction

Objective. . In this work, the goal was to test new activated carbons AU-T and AU-K from local raw materials during filtration of spent MDEA.

Method. To obtain samples of activated carbons, carbonization of mulberry and maple wood was carried ouf in a laboratory tubular reactor with electric heating without air access, and the obtained carbonizates were activated with water vapor

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for 4—6 hours. To test the obtained samples of activated carbons during the filtration of the spent MDEA solution, as well as the analysis of the physicochemical and technical properties of the purified solution at the Bukhara Oil Refinery LLC produces, analysis methods were applied n accordance with State standards and factory regulations.

Activated carbon is renowned for its high surface area and porous structure, making it an effective adsorbent for removing contaminants from water and air. While various raw materials have been utilized for activated carbon production, the use of Arink seed shells remains unexplored. This study aims to fill that gap by investigating the potential of Arink seed shells as a precursor for activated carbon and evaluating the structural-sorption characteristics of the produced material.

Scientific novelty. New samples of activated carbons based on mulberry (AU-T) and maple (AU-K) showed the best results ›n terms of adsorption properties and clean› ng abilities when compared with the characteristics of factory-made, imported activated carbon grade AG-3 (Russia).Received data**.** Sorption measurements of benzene adsorption on activated carbon AU-KU were carried out on a high-vacuum installation with mercury valves and McBen quartz balances at a residual pressure of 1.33·10-3 Pa and 298 K. The elongation of the springs was controlled using a KM-8 cathetometer

The figure shows the adsorption isotherm of benzene on activated carbon AU-KU. From the adsorption isotherm of benzene on AU-KU coal, one can find out that at a low relative pressure P/Ps = 0.2, a sharp increase in the isotherm is observed, which means a large amount of benzene sorption.

Arink seed shells were collected, cleaned, and dried before undergoing carbonization at temperatures ranging from 400°C to 600°C in an inert atmosphere. Chemical activation was performed using agents such as phosphoric acid (H_3PO_4) and zinc chloride ($ZnCl_2$) at varying concentrations. The activation process aimed to enhance porosity and surface area.

Characterization Techniques

- BET Surface Area Analysis: Determined the specific surface area and pore volume of the activated carbon samples.
- FTIR Spectroscopy: Identified functional groups present on the surface of the activated carbon.
- SEM Imaging: Examined the surface morphology and pore structure

Conclusion. New types of activated carbons were obtained from mulberry and maple wood; activated carbons AU-T and AU-K showed the best results in terms of adsorption properties and cleaning abilities when compared with the characteristics of factory-made, imported activated carbon of the AG-3 brand.

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In the world, the active development of the chemical, metallurgical, oil and gas industries has led to an increase in the need for effective adsorbents to obtain high-quality products, selective sorption and purification of substances. In this regard, at present, in the fields of colloidal chemistry, oil and gas, the production of effective microporous activated carbons based on organic raw materials and their practical use in the purification of various reagents and products is of particular importance.

Bukhara Oil Refinery LLC produces high-quality jet fuel Jet A-1 (kerosene) for the world's most famous companies Boeing, Airbus and local airlines. The kerosene fraction demercaptanization device (BNPP, device No. 12) plays an important role in ensuring that the quality of this fuel meets international standards. This device uses various reagents and activated carbon imported from abroad to purify kerosene from sulfur compounds in the form of mercaptans and various other mineral additives.

According to Bukhara Oil Refinery LLC, in 2021, in order to meet the needs in the process of kerosene demercaptanization, 5400 kg (30 m3) of activated carbon of the ACTICARBONE BGP MX 10x30 brand from Chemviron (France) was imported, costing 2140 US dollars per 1 m3 (180 kg) . A total of 64,200 US dollars were spent on imports. It is important to consider that the country has a sufficient raw material base for the production of activated carbon of this type.

According to the country's policy of modernizing the chemical and oil and gas industries, as well as the production of goods based on local raw materials for the purpose of import substitution, the production of activated carbon using local raw materials and its use in the process of demercaptanization of the kerosene fraction remains an urgent task for scientists and specialists in the field of petrochemistry and processing oil and gas.

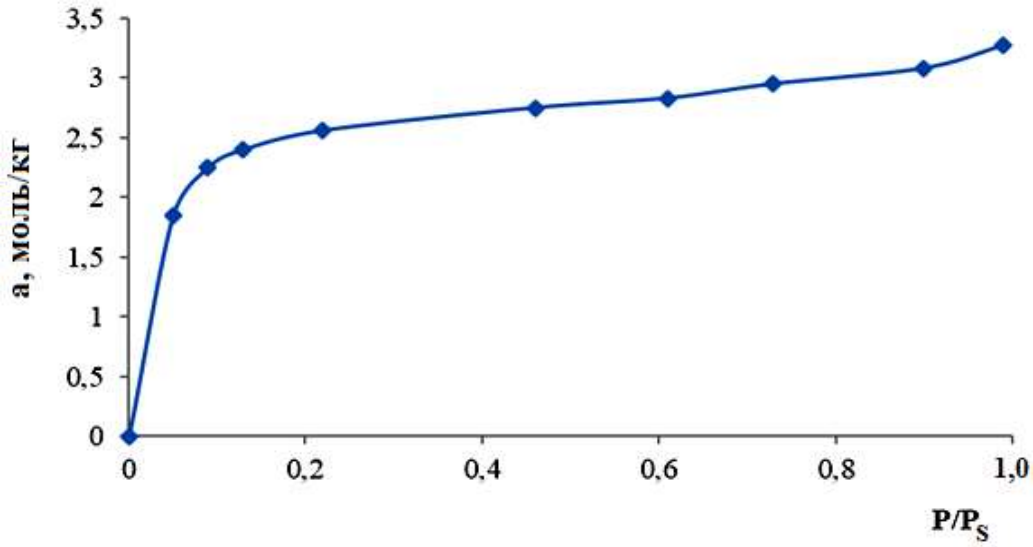
For the purpose of import substitution, a laboratory installation was developed and a sample of activated carbon from apricot seed shells (AU-KU) was obtained using this installation. The sorption characteristics of the resulting sample were studied.

Sorption measurements of benzene adsorption on activated carbon AU-KU were carried out on a high-vacuum installation with mercury valves and McBen quartz balances at a residual pressure of 1.33·10-3 Pa and 298 K. The elongation of the springs was controlled using a KM-8 cathetometer

The figure shows the adsorption isotherm of benzene on activated carbon AU-KU. From the adsorption isotherm of benzene on AU-KU coal, one can find out that at a low relative pressure P/Ps = 0.2, a sharp increase in the isotherm is observed, which means a large amount of benzene sorption. With increasing

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relative pressure, the adsorbent is gradually saturated and the isotherm changes to linear. In the relative pressure range P/Ps=0.4-0.6, an increase in the isotherm is observed



Drawing. Adsorption isotherm of benzene on activated carbon AU-KU

Based on the adsorption isotherm data, the structural and sorption characteristics were calculated: specific surface area, monolayer capacity, limiting adsorption using the BET equation, and pore volumes were also calculated. The results obtained are shown in tables 1 and 2.

Table 1

Structural and sorption characteristics of activated carbon AU-KU

Sample	a_m, mol/kg	a_s, mol/kg	$S \cdot 10^{-3}$, m^2/g
АУ-КУ	1,77	3,27	426

Table 2

Structural and sorption characteristics of activated carbon AU-KU and other industrial samples

Образец	Micropore volume $W_0 \cdot 10^{-3}$, m^3/kg	Mesopore volume, $W_{me} \cdot 10^{-3}$, m^3/kg	Total adsorption volume, $V_s \cdot 10^{-3}$, m^3/kg
АУ-КУ	0,262	0,029	0,291
БАУ	0,128	0,031	0,159
ОУ-А (модифиц.)	0,390	0,140	0,530
ФАС (рекопласт)	0,210	0,05	0,215

The adsorption isotherm of benzene on activated carbon AU-KU showed that AU-KU carbon belongs to microporous sorbents: the total adsorption volume is 0.291 m3/kg, the micropore volume is 0.262 m3/kg, the mesopore volume is 0.029

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m3/kg, and the total dynamic capacity is 3.27 mol/kg and by comparing its structural and sorption characteristics with the characteristics of other industrial samples, it was established that AU-KU coal can compete with foreign analogues

This study confirms that Arink seed shells are a viable and sustainable precursor for producing high-quality activated carbon. The resulting material's structural and sorption characteristics make it an excellent candidate for environmental remediation applications. Utilizing agricultural waste like Arink seed shells not only adds value to these byproducts but also contributes to sustainable environmental management practices.

REFERENCES

1. Oripova L.N., Khayitov R.R. Obtaining activated carbon from wood and stone raw materials *II* Universum: technical sciences: electron. scientific magazine 2021. No. 9(90). - pp. 14-17.

2.Bakhramov N.I., Teshaeva M.Sh., Khayitov R.R. Development of a method for obtaining activated carbon from local raw materials for the adsorption purification of spent amine solutions Science and Education sc enti ic ourna Vo u e 3. - Issue 4. 2022. - R. 377-383

3.Khayitov R.R. Development of technology for obtaining activated carbon from local raw materials for the purification of waste amine solutions: Abstract of the thesis. d.t.s. - Tashkent, 2019. - 67 p.

4.Khayitov R.R., Shermatov B.E., Eshonkulov U.U., Narmetova G.R. Carbonization of apricot kernels and steam activation of carbonizate to obtain activated carbon *II* Uzbek chemical journal. - Tashkent, 2017. - No. 3. - S. 65-694.

5.Khayitov R.R., Eshonkulov U.U., Narmetova G.R. Activated carbons from local raw materials for the regeneration of alkanolamines for natural gas purification instead ofsorbent AG-3 *II* Scientific and technical journal: World of petroleum products. Bulletin ofoil companies. - Moscow (RF), 2016. - No. 11. - S. 43-46.

6.Khayitov R., Narmetova G. Production of activated coal from the pits of apricots and peach for the adsorption purification of the waste Diethanolamine // Austrian Journalof Technical and Natural Sciences «East West» Association for Advanced Studies and Higher Education GmbH. - Vienna, 2016. - № 7-8. - P. 67-706.

7.Khayitov R., Narmetova G., Shermatov B. Regeneration of activated carbon used in adsorption purification of alkanolamines // Austrian Journal of Technical and Natural Sciences «East West» Association for Advanced Studies and Higher EducationGmbH. - Vienna, 2016. - № 7-8. - P. 75-77.

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