IRSTI 31.15.33

A.K. Kozybaev[1] – *main author,*
Zh.Dzh. Alimkulova[2]

[1]PhD, Associate Professor, [2]Master of Chemical Sciences, Senior Lecturer
[1]https://orcid.org/0000-0003-1792-5993; [2]https://orcid.org/0000-0002-9938-6710
[1,2]JSC "Almaty Technological University",
Almaty, Kazakhstan
[1]aruzhan171118@gmail.com

https://doi.org/10.55956/RPLY3112

METHODS FOR STUDYING ADSORBENT BASED ON RECYCLED PLANT MATERIALS

Abstract. The production of adsorbent is aimed at purifying water from oil and ensuring water purity. Experimental work was carried out to determine the effectiveness of sorbents (car tires, sawdust, corn residues) in the purification of oil-contaminated wastewater. Sorbents are designed to remove oil, fat, fuel oil and other water-insoluble organic pollutants from the water surface, as well as from the surface of any solid bodies, regardless of the width of the area of distribution and high temperature, regardless of the thickness of the layer.

Keywords: adsorbents, hydrophobic, calibration graph.

Kozybaev A.K., Alimkulova Zh.Dzh. Methods for studying adsorbent based on recycled plant materials // Mechanics and Technology / Scientific journal. – 2023. – No.4(82). – P.128-132. https://doi.org/10.55956/RPLY3112

Introduction. Environmental efficiency of work improving the environmental situation in oil-producing areas and territories contaminated with petroleum products. The purpose of the experimental work is to test the effectiveness of adsorbents obtained from secondary residues of domestic agricultural plants [1]. Corn residues and sawdust are accepted as secondary residues of agricultural plants. Car tires, which are relatively out of use, were used as sorbents. Tires are tertiary waste and have not yet been used in our country. The resulting corn and tire scraps were converted to carbon and the sawdust was used as is. To prepare the sorbent, the residue is crushed and burned at a temperature of 200-400°C. The surface area of the resulting sorbents was 0.5-5 mm. The sorbents were not treated with any chemical reagents [1]. Oil is hydrophobic and water is hydrophilic, so water and oil do not mix. Adsorbents exhibit hydrophobic properties regardless of the preparation method; adsorbents float on the surface of water [2].

The hydrophobicity of adsorbents was tested experimentally as follows. 1000 cm^3 of test water is poured into a container and mixed with 0.4 cm^3 of a 10% sodium nitrite solution, 5 cm^3 of H_2SO_4 with a density of 1.84 g/cm^3 and 10 cm^3 of a mixture of chloroform and carbon tetrachloride (1:1). The hydrophilic and hydrophobic parts of the mixture are separated through a separating funnel. The isolated hydrophobic phase is centrifuged at 5000 rpm for 10 min and the fluorescence intensity of the organic phase is measured at 430 nm.

Conditions and methods of research. The concentration of petroleum product in the sample is determined from the calibration curve. Calibration table. 1000 cm^3 of distilled water is poured into a separating funnel, 5 cm^3 of H_2SO_4 with

a density of 1.84 g/cm^3 is added [2] and 0.00, 0.05 are added; 0.10; 0.15; 0.20; 0.40; 0.60; 0.80; 1.00; 2.00; 4.00; 8.00 cm^3; A mixture of carbon tetrachloride and chloroform and diesel fuel are added in a 1:1 ratio (1 mg of oil residue is in 1 cm^3 of solution). A mixture of carbon tetrachloride and chloroform (1:1) is introduced into all packages, so in all cases the volume of the organic phase is 10 cm^3 and 10% of a 0.4 cm^3 aqueous solution of $NaNO_2$ is added [2]. The compound was allowed to liquefy, shaken for 10 minutes, 10 cm^3 of the organic phase was separated, centrifuged for 10 minutes at 5000 rpm and examined with a spectrophotometer at wavelengths λ=378 nm and λ=430 nm. The calibration graph is based on 1000 cm^3 of H_2O with an oil product content of 0.04-10 g [3].

Light absorption at wavelengths λ=378 nm and λ=430 nm to construct a calibration curve (Table 1, Figure 1).

Table 1

Calibration curve data at wavelengths

No.	Diesel fuel C (g/l)	λ= 378 nm	λ=430 nm
1	0.000	0.000	-0.000
2	0.200	0.180	-0.000
3	0.400	0.360	-0.007
4	0.600	0.530	0.003
5	1000	0.880	0.054
6	2000	1775	0.106
7	3000	2660	0.177
8	3400	3000	0.221
9	4000	3000	3000

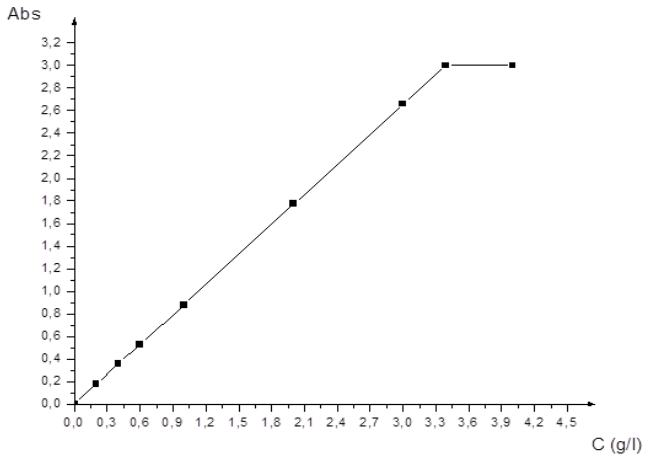

Figure 1. Calibration curve based on data for wavelength λ=378 nm.

Research results and discussion. Polluting diesel fuel 4; 0.1; 0.05; High level of activity at a concentration of 0.025.

Below are the results obtained before and after treatment of wastewater contaminated with diesel fuel (Table 2).

The analytical signal in molecular absorption spectrometric analysis is in the wavelength range from 200 to 750 nm. These regions are included in the ultraviolet and visible regions [3].

Table 2

Optical density indicators

Wavelength	Optical density indicators			
	Before cleaning	After cleaning		
		Waste tires	Sawdust	Corn waste
λ=378 nm	3000	0.390	1700	0.150
λ=430 nm	3000	0.200	0.700	0.070

Separation of organic phase from wastewater presented in Figure 2.

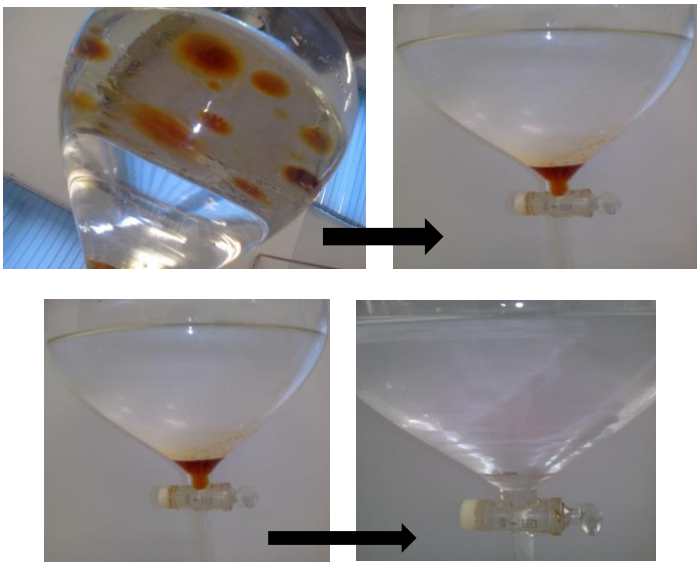

Figure 2. Views before and after cleaning

Experimental work was carried out to determine the effectiveness of sorbents (car tires, sawdust, corn residues) in the purification of oil-contaminated wastewater. The analysis was carried out using a FLUORATE-2 device. Working method: 1L of water was mixed with 5g of oil to prepare waste water. Three of the four samples prepared in one volume were filled with 1 g of different sorbents in one volume, one of which was used as a sample before purification (Table 3). To check the degree of purification of the sorbents, the organic matter was washed in waste water with 25 cm^3 of hexane [4]. The resulting hexane is passed through alumina using a 10 mm diameter column. The device measures defatted hexane. We measured the optical density at wavelengths λ─378 nm and λ─430 nm (Table 4).

Table 3

Results before and after treatment of oil-contaminated wastewater

Polluter	Sorbents	Sorbent weight, G	Concentration of pollutants g/l	
			Clear before	after cleaning
Oil	Waste tires	1.00	5.00	0.58
	Sawdust	1.00	5.00	2.30
	Corn waste	1.00	5.00	0.25

Table 4

Degree of purification of sorbents

Polluter	Sorbents	Optical density			Degree of purification %
		Clear before	after cleaning		
			λ─ 378 nm	λ─ 430 nm	
Oil	Waste tires	3000	0.389	0.189	89.6
	Sawdust	3000	1700	0.714	59.4
	Corn waste	3000	0.150	0.070	95.7

The sorption abilities of the studied sorbents for the purification of groundwater from oil and petroleum products are effective adsorbents prepared on the basis of secondary plant raw materials [4]. Due to their high porosity, adsorbents obtained from corn residues showed the highest properties among the studied adsorbents, that is, they can be considered as highly effective sorbents for purifying water from oil products. They do not need to be converted into a hydrophobic form first. If sorbents based on wood waste are not pre-treated, they will absorb water along with oil and seriously increase the degree of water pollution [1].

The advantages of sorbents for collecting petroleum products: conditional use of environmentally friendly, natural organic substances and the absence of chemical reagents during their extraction. Long-term swimming on the surface of the water before and after absorption of oil and petroleum products [5,6]. From an economic point of view, the sorbents are more effective than other powdered sorbents on the market in removing oil contaminants. In the technology of purifying water contaminated with any oil and petroleum products, it is first necessary to clean the surface of the water.

Conclusion. Sorbents are designed to remove oil, fat, fuel oil and other water-insoluble organic pollutants from the water surface, as well as from the surface of any solid bodies, regardless of the width of the area of distribution and high temperature, regardless of the thickness of the layer. Of the sorbing materials studied, the most effective at. Pine sawdust was used to clean up a simulated motor oil spill.

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Material received on 15.12.23.

А.Қ. Қозыбаев[1], Ж.Ж. Әлімқұлова[1]

[1]"Алматы технологиялық университеті" АҚ, Алматы қ, Қазақстан

ҚАЙТАЛАМА ӨСІМДІК ШИКІЗАТЫНА НЕГІЗДЕЛГЕН АДСОРБЕНТТІ ЗЕРТТЕУ ӘДІСТЕРІ

Аңдатпа. Адсорбент алу суды мұнайдан тазартуға және судың тазалығын қамтамасыз етуге бағытталған. Мұнаймен ластанған ағынды суларды тазарту кезінде сорбенттердің (автошиналар, үгінділер, жүгері қалдықтары) тиімділігін анықтау бойынша тәжірибелік жұмыстар жүргізілді. Сорбенттер су бетінен, сондай-ақ таралу аймағының еніне және жоғары температураға қарамастан кез келген қатты денелердің бетінен майды, майды, мазутты және басқа да суда ерімейтін органикалық ластаушы заттарды кетіруге арналған.

Тірек сөздер: адсорбенттер, гидрофобты, калибрлеу кестесі.

А.К. Козыбаев[1], Ж.Д. Алимкулова[1]

[1]АО «Алматинский технологический университет», Алматы, Казахстан

МЕТОДЫ ИССЛЕДОВАНИЯ АДСОРБЕНТА НА ОСНОВЕ ВТОРИЧНОГО РАСТИТЕЛЬНОГО СЫРЬЯ

Аннотация. Получения адсорбента направлена на очистку воды от нефти и обеспечение чистоты воды. Проведены экспериментальные работы по определению эффективности сорбентов (автомобильные покрышки, опилки, кукурузные остатки) при очистке нефтезагрязненной сточной воды. Сорбенты предназначены для удаления нефти, жира, мазута и других нерастворимых в воде органических загрязнителей с водной поверхности, а также с поверхности любых твердых тел, независимо от ширины области распространения и высокой температуры, независимо от толщины слоя.

Ключевые слова: адсорбенты, гидрофобный, градуировочный график.