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**Shixaliyev Kerem Sefi**

Doctor of Technical Sciences,  
Professor-Academician of the  
European Academy of Natural  
Sciences, Azerbaijan State Oil  
and Industry University Baku,  
Azerbaijan, 20 Azadlig  
Avenue.

**Correspondence:**

Doctor of Technical Sciences,  
Professor-Academician of the  
European Academy of Natural  
Sciences, Azerbaijan State Oil  
and Industry University Baku,  
Azerbaijan, 20 Azadlig  
Avenue.

## Ecological problems of transportation of oil and oil products and methods of cleaning the water surface

**Shixaliyev Kerem Sefi**

### Abstract

In this work, we studied the sorbent obtained based on used car tires, which is a rheum crumb with a size of 0.4-0.8 mm, which is a highly effective environmentally friendly material capable of trapping oil and oil products, oil, diesel fuel, gasoline, toluene, methanol, etc. Studies have shown that rubber crumb provides a high sorption capacity to absorb the mass (1:5) and fast (in 15 seconds) sorption of an oil slick, significantly surpassing both the speed and the degree of absorption of known sorbents. The sorbent we obtained based on neoprene rubber is practically not wetted by water and can collect oil and oil products in an amount 10-12 times greater than its weight.

**Keywords:** Absorption, ecology, oil products, sorbent, worn tires ecology, water surface cleaning from oil and oil products.

### Introduction

Almost the entire technological chain for the exploration and production of oil, its transportation on, storage, ending with the processing and use of petroleum products, is associated with severe environmental pollution. At the same time, the deterioration of the ecology of the environment primarily affects human health. In other words, a person, exerting an anthropogenic impact on the environment, subsequently encounters the "boomerang" law himself, being exposed to a high level of pollution (Absorption et al.1979), (Pashchenko et al.1983), (Amirov et al.2012,2018,2020)

In the conditions of intensive industrial development, oil continues to be the most efficient and popular type of fuel (Pomanaryal.1985), (Alimov et al.1986),. (Anisimova et al.2010), (Anito Anisimova et al.2011), According to forecasts, the demand for oil in the world will continuously grow. Judging by the explored reserves, in 2020-2030. practically all oil will be produced in the world (Davankov et al. 2000), (Belov et al.2012), (Alizade et al. (2022) although according to the total amount of dispersed hydrocarbons in the sedimentary rocks of the continents is approximately  $80 \times 10^{17}t$ , which is ten times higher than the explored reserves ( $2.2 \times 10^{17}t$ ). The problem of cleaning surface and wastewater from oil is one of the cardinal problems of environmental protection, oil, and oil products cause great damage to the biosphere (Grusov et al. 2000), (Chen et al. 2017, 2018) Ocean pollution has reached catastrophic proportions, 30 million tons fall into it. oil per year. The area of the oil film on the surface is 1/5 of the area of the ocean. An oil film of this size is very dangerous. It disrupts gas exchange and moisture exchange between the atmosphere and the hydrosphere, inhibits the development of life, and uses a higher (2-3%) albedo than the surface of a pure ocean. Annual oil losses are estimated at billions of dollars. An important cause of environmental disasters is the excess permissible wear of equipment (Serenko.2007),(Karaman et al. 2009, 2011, 2012). Therefore, cleaning the surface of the water from oil products today solves not only the environmental problem, but also the economic Shixaliyev (2022)

### Method

After a run of 90-110 km, car tires break down and turn into waste.

Tire waste is a huge environmental problem, so this valuable product can be recycled to get:

- rubber dust with a size of 1 mm (used mainly in the modification of road bitumen);
- rubber crumb with a size of 1-10 mm (used in the pyrolysis process)
- metal cord (used as metal shavings)
- cord waste (used as a raw material in the textile industry)
- In addition, residues that cannot be recycled are used in pyrolysis processes:
- gas (can be used as natural gas);
- light fractions of pyrolysis (they are a valuable raw material and can be used as liquid fuel);

We obtained the sorbent with a size of 0.1-0.8 mm by processing the tread part of radial tires on grinding discs. (Kerem 2019)

Recently, sorbents have been obtained by various methods, in which among them sorbents based on synthetic polymers, which can be used to clean water surfaces from pollution, were developed by the author Shixaliyev (2018, 2021,2022)

The sorbent of oil and oil products obtained by News orb has an optimal ratio of sorption capacity to bulk density. To collect 1 ton of oil, 90-100 kg of sorbent or 1.3-1.6 cu. meters. The sorbent is supplied in a sealed package - a propylene bag with a polyethylene liner, weighing 11-14 kg, V=0.08 m3.

**Results and Discussion**

The environmental problem of recycling used car tires is acute in most developed countries of the world, and the annual volume of old tires to be recycled is millions of

tons. Given that polymers do not biodegrade, they cause great environmental damage to flora and fauna. Due to the lack of special sites, worn-out car tires are thrown into landfills, along roads, into water bodies, etc., causing not only harm to the environment, but button also causing several diseases (for example, asthma, skin diseases, tumors). At present, worn-out car tires are processed in large quantities into crumb rubber or rubber dust.

In this regard, the possibility of using crumb rubber obtained from the tread part of used car tires as a sorbent for cleaning the water surface from oil and oil products was studied in this work.

The tread part of automobile tires is made of tread rubber based on a mixture of styrene-butadiene and divinyl rubbers BSK + SKD (70:30), containing 50 wt. hours carbon black.

Our studies have shown that tread crumb rubber differs from other tire rubber crumbs in that, due to its high crushing rigidity, it does not roll into a roll, but as an elastic mesh structure, therefore it has a large adsorption surface. In addition, the above features of the tread rubber make it possible to obtain on its basis a non-stick rubber crumb 0.06-0.08 mm in size without the use of additional materials, and, therefore, it can be successfully used as a sorbent. The obtained sorbents of the tread part of the radical tire were used to clean the water surface from oil and oil products. An important feature of crumb rubber made from tread rubber as a sorbent is its buoyancy and the ability to collect petroleum products on the surface. The study was conducted in the Caspian Sea and the data obtained from the studies are presented in Tables 1-2.

**Table 1:** The aloof unnumbered oil products and the degree of purification of the water surface,

Quality sorbent, grams	Quantity spilled oil, grams	The amount absorbed oil, g	Absorption coefficient oil	Degree Cleansing Water surface, %
0,5	10	2,5	5	25
1,0	10	5,0	5	50
1,5	10	7,5	5	75
2,0	10	10	5	100

**Table 2:** The degree of absorption of oil proposed and the prototype.

sorbent-prototype	Degree of oil absorption, %	
	sorbent-prototype	The proposed sorbent is our sorbent
60	145	-
5	-	350
10	-	420
15	-	500
20	-	500

An important feature of crumb rubber as a sorbent is its similarity to petroleum and petroleum products because they both consists of carbohydrates.

As can be seen in Table. 3 and 4, rubber crumb obtained on the based unread part of used car tires provides a high sorption capacity for oil absorption (1:5) and fast (in 15 seconds) sorption of an oil slick, significantly exceeding both in speed and degree of oil absorption known sorbents.

the possibility of localizing an oil slick and ensuring the protection of the coastline.

The sorbent can also be used to purify industrial wastewater from oil and oil products (Table 3)

**Table 3:** Specifications of the used tire sorbent.

The name of the indicator	meaning
The mass absorption capacity of oil products, kg/kg Shelli	14-20
Bulk density, kg/m <sup>3</sup>	85
Particle size, mm	0,06-0,09
Capture and retention of vapors and odors, %	98
Heat resistance, °C	200
The pH of the water extract	5,5-6,5
abrasiveness	missing
Degree of purification of industrial effluents from oil products, %	98,9
Degree of water purification from heavy metals (Pb, Cu, Cr), %	87,3-98,9
Degree of water purification from hydrocarbons, %	98,9-99,5
Degree of water purification from pesticides, %	99,4-99,9

the obtained data and shows that the data obtained by us and studied in the sea showed that the proposed sorbent outperforms all its analogs

The results of the study at sea show that the data obtained by us prove that the proposed sorbent is superior to all its analogs and can be successfully used to clean the surface of the water in the sea and the world's oceans.

### Conclusion

After application in the Caspian Sea, it was found that the sorbent based on worn tires is significantly superior in its characteristics to other sorbents.

Its use for cleaning the surface of the water from oil and oil products is much more appropriate since it floats and collects oil and oil products and forms an agglomerate. The agglomerate can float on the surface of the water and collect oil and oil products. The oil sorbent based on retinal significantly outperforms sorbents of oil products from natural raw materials in its characteristics, and other sorbents, the advantage of which is their exceptionally low price. At the same time, the sorbent based on rubber crumb has a high sorption capacity and absorption rate (90-95kg/min/kg), and the degree of purification is 99.5-99.8%. The sorbent is regenerated by pressing on a press, and after separating oil products from it, we successfully used it (Shixaliyev 2022) in the modification of road oil bitumen. The mass capacity of the sorbent obtained by us is 38-42 g/g, depending on the oil product, which is 2-4 times higher than that of the best foreign analogs.

The rubber crumb of the tread rubber, due to its mesh structure, swells in the oil and ensures its retention. As a result of the sorption of oil and oil products on the water surface, an agglomerate is formed, which has a density lower than that of water and occupies a much smaller area compared to a spot of sorbet oil. This agglomerate is easily collected by any mechanical means (for example, metal mesh buckets). The resulting agglomerate after the maximum separation of oil can be reused, and then for the modification of road bitumen

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