Project Description

The intensification of oil extraction, storage, transportation and processing processes in the world, and especially the intensification of oil and gas extraction in the sea and ocean, and the transportation of oil and oil products, leads to an increase in the level of pollution of open water bodies with oil and oil products.

A few years ago, as a result of an explosion at an oil extraction facility owned by BP in the Gulf of Mexico, 100,000 tons of oil spilled into the Gulf and all coastal areas within a few days. Billions of dollars in damage to the flora and fauna of the United States. It should be noted that the direct damage caused by such disasters is very small compared to the indirect damage. In many cases, the consequences of such accidents cannot be eliminated for decades.

It should be noted that the accident of the "Torry Kenon" tanker in March 1967 made the coastal countries face a new phenomenon - large-scale pollution of the sea as a result of a maritime disaster.

More than 3,500 tons of oil spilled into the ocean on September 26, 1974, when the American tanker "Grans Jezon" crashed off the coast of India. The spilled oil covered 100 thousand square kilometers of water surface.

It should be noted that the consequences of accidents in transhighway oil pipelines passing through the bottom of the sea and ocean are particularly dangerous.

Every year, the number of accidents that lead to an increase in the general pollution of open water bodies with oil and oil products is increasing. Therefore, intensive work is currently being done in the field of combating oil spilled into open water bodies, collecting this oil and creating effective means for cleaning the water surface from its residues.

Collecting and disposing of surface oil spills is a complex problem. The most accepted methods and means to reduce the harmful effects of spilled oil on water flora and fauna are mechanical methods and means.

However, it should be noted that the existing mechanical methods and tools for collecting oil from the water surface are less efficient and do not provide the required degree of cleaning.

One of the methods of collecting oil spilled into the sea from the water surface is the use of special chemical reagents - dispersants. These reagents make it possible to remove stratified oil from the surface of the water basin in a relatively short time. As a rule, these are biological soft surfactants and have high emulsifying and peptizing properties.

Dispersants can be used after mechanical collection and as the primary method of spilled oil removal.

The problem of oil pollution of the Caspian Sea takes the main place due to its antiquity, multifaceted impact on fauna and flora, physical and chemical properties of water, seabed sediments. Currently, almost the entire water area of the Caspian Sea and all the rivers flowing into it are polluted with oil. In the 1950s and 1960s, oil pollution was specific only to the sea area of oil fields and the zone where waste water from oil refineries was discharged, but in the 1980s, such pollution spread to all parts of the sea. According to estimates based on known sources, 2.5 million tons of crude oil have flowed into the sea since the oil discovery of the Caspian Sea. Only in 1969, 47,000 tons of oil were discharged into the sea with the ballast water of oil-carrying tankers, and 7,000 tons of oil from the water of ships. There are so many accidents at sea that: in the 60s, 4,000 tons of gas and oil condensate flowed into the sea as a result of an accident on the Middle and Southern shelf of the Caspian Sea, a fire that did not go out for months, and 20,000 tons of gas-oil condensate from operating gryphons. In 1983, 1.43 g of oil per 1 kg of sludge was recorded in the soil at a depth of 200 m in the southwest of Ogurchali Island, and in 1955, at the border of the South and Middle Caspian Sea, at a depth of 270 m in the soil at a depth of 0.86 g per 1 kg of sludge. The soil in Baku Bay is saturated with oil products from 5-7 m to the bottom of the sediments. Unlike other pollutants, oil is easily transferred to other areas and remains for a relatively long time. For the complete mineralization of 1 kg of oil, 400 liters of oxygen in sea water are consumed. The characteristic signs of pollution by oil products are the multiplicity of sources, polluting almost all components of the environment, scattering over a large water area, accumulation in bottom sediments, etc. Soluble and heavy components - fractions of oil adsorb other toxicants, including toxic metals, in the water mass, causing their migration. They deteriorate the quality of water, have a negative effect on the oxygen regime, disrupt the balanced connection of the upper layers of water with the atmosphere, etc. Oil pollution has fundamentally changed the environmental conditions on the western shelf of the southern Caspian Sea. During the 15 years from 1961 to 1976, the primary yield of photosynthesis of phytoplankton decreased 50 times in the water areas of the islands of the Baku-Absheron archipelago. Phytobenthos has been destroyed in Krasnovodsk Bay, Chelakan Peninsula. Oil-contaminated areas are also almost devoid of zoobenthos. Anaerobic processes dominate the bottom sediments of these areas. Pollution of the

North Caspian Sea is mainly caused by river flows and oil deposits in the sea. Rising sea levels shorten the distance to oilfields on the coast, and with frequent winds, waves wash away dams and flood offshore oilfields. The concentration of hydrocarbons in the waters of the North Caspian varies from 0.43 to 16.0 mgl. The concentration of hydrocarbons in the central part of the field is on average 0.11–0.20 mgl. As a rule, the maximum indicator is characteristic of river waters and the water area of ports, where the amount of oil products is 1.46–2.07 and 9.4–10.3 mgl, respectively. There are also a number of areas in the South Caspian called dead zones due to the degree of pollution. This includes the Neft Daslari aquatroria, Baku, Krasnovodsk bays and the shores of the Chalekan peninsula. The amount of oil in the waters of these areas reaches 1.26–3.83 mgl. The amount of oil in the soil of Oil Stones - near the main body, the main jetty (through the jetty) is up to 24 g kg, in the poorly silted sediments of the Jiloy Islands, on the Pirallahi Peninsula - 15-20 gkg, in the soil of the Krasnovodsk Bay (center) - 1.9, near the port - 123 kkk, it reaches 46-57 kkk near the Çelakan peninsula. Baku Bay is a real warehouse of oil products. Here, the soil is saturated with oil products at a depth of 3.5–5.7 m. The amount of oil products in the upper 20-25 cm layer is 67% of the total weight. Soil saturation with oil products is also characteristic of the islands of the southern Caspian Sea, the Pirsaat range and the Garadag area, where the concentration of oil on the water surface is 0.43–1.26 mgl, and 0.63–2.3 mgl in the soil.

Equipment sinking in water, oil products flowing into the sea, facilities becoming unusable, etc. for such reasons, the Caspian Sea is exposed to more hydrodynamic threats in the southern and central areas.

For this reason, under the leadership of academician V.M. Abbasov, k.e.d., prof. With the participation of S.A. Mammadkhanova, the study of salts, complexes and oxyethers obtained on the basis of SNT as oil dispersants was carried out in the "Surfactant reagents and preparations" laboratory of the Institute of Petrochemical Processes named after Y.H. Mammadaliyev.

Three different types of oil of Azerbaijan - Pirallahi, Naftalan and Surakhani - were taken as the object of research.

40 grams of drinking water was poured into the Petri dish and 2 grams of oil was added to it. 5% solutions of synthesized salts and complexes in water were prepared. Then the analysis was carried out by adding 0.02g of that solution to a Petri dish completely covered with oil. The ratio of SAM's active substance to oil was taken as 1:2000 mass ratio. The obtained results are given in the table.

Table. The results of the investigation of the properties of 5% solutions of salts, complexes and oxyethers of SNT on the accumulation of Naphthalan oil from the surface of drinking water (reagents were used as a 5% solution in water)

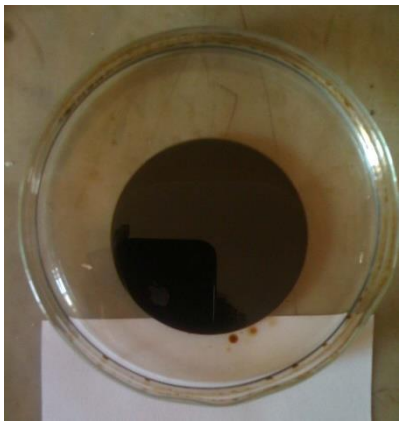
Komplekslər	Yığılan neftin diametri							
	Hazır-landığı an, sm	1,5 saatdan sonar, sm	3,0 saatdan sonar, sm	21 saatdan sonra, sm	24 saatdan sonra, sm	25,5 saatdan sonra, sm	27 saatdan sonra, sm	45 saatdan sonra, sm
SNT:OP 1:8 mol nisbətində alınmış oksi efir	5,2	3,3	3,1	3	3	3	3	3,4
SNT-nin TEA komp. kran suyunda	6,3	5	5,5	10,0	10,0	10,0	10,0	10,0
SNT-nin PEPA ilə kompleksi	uzun 4,5 eni 2,1	uzun 5,3 eni5,8	uzun 5,5 eni 7	10,0	10,0	10,0	10,0	10,0
SNT-nin DEA kompleksi	5	3,5	3	3,3	3,3	3,3	3,3	3,6
SNT-nin MEA kompleksi	7	7,5	7,5	10,0	10,0	10,0	10,0	10,0
SNT-nin K duzu	5,6	4,5	3,7	5	5,2	5,3	5,4	6,2
SNT-nin Na duzu	6,5	5,3	4,5	6,5	7,3	7,3	7	10,0
SNT-nin NH_4 duzu	6	5	5	10,0	10,0	10,0	10,0	10,0

Note: The oxyether of SNT with OP was used as a 5% solution in isopropyl alcohol.

As can be seen from the table, among the substances tested, the best result was obtained with the oxyether of SNT. Thus, the diameter of the oil layer decreased to 5.2 cm at the time of SAM solution, 3.3 after 1.5 hours, 3.1 after three hours; It was 3 cm from 21 to 27 hours, and 3.4 cm after 45 hours.

It was determined that the solutions of SNT oxyethers in alcohol have a higher oil dispersing effect. Thus, when 0.02 grams of 5% solution of SNT oxyethers in high molecular weight alcohol is added to the layer formed by 2 grams of oil in a Petri dish with a diameter of 10 cm and 40 grams of water poured into it, the diameter of the collected oil becomes ≤ 1.8 cm.

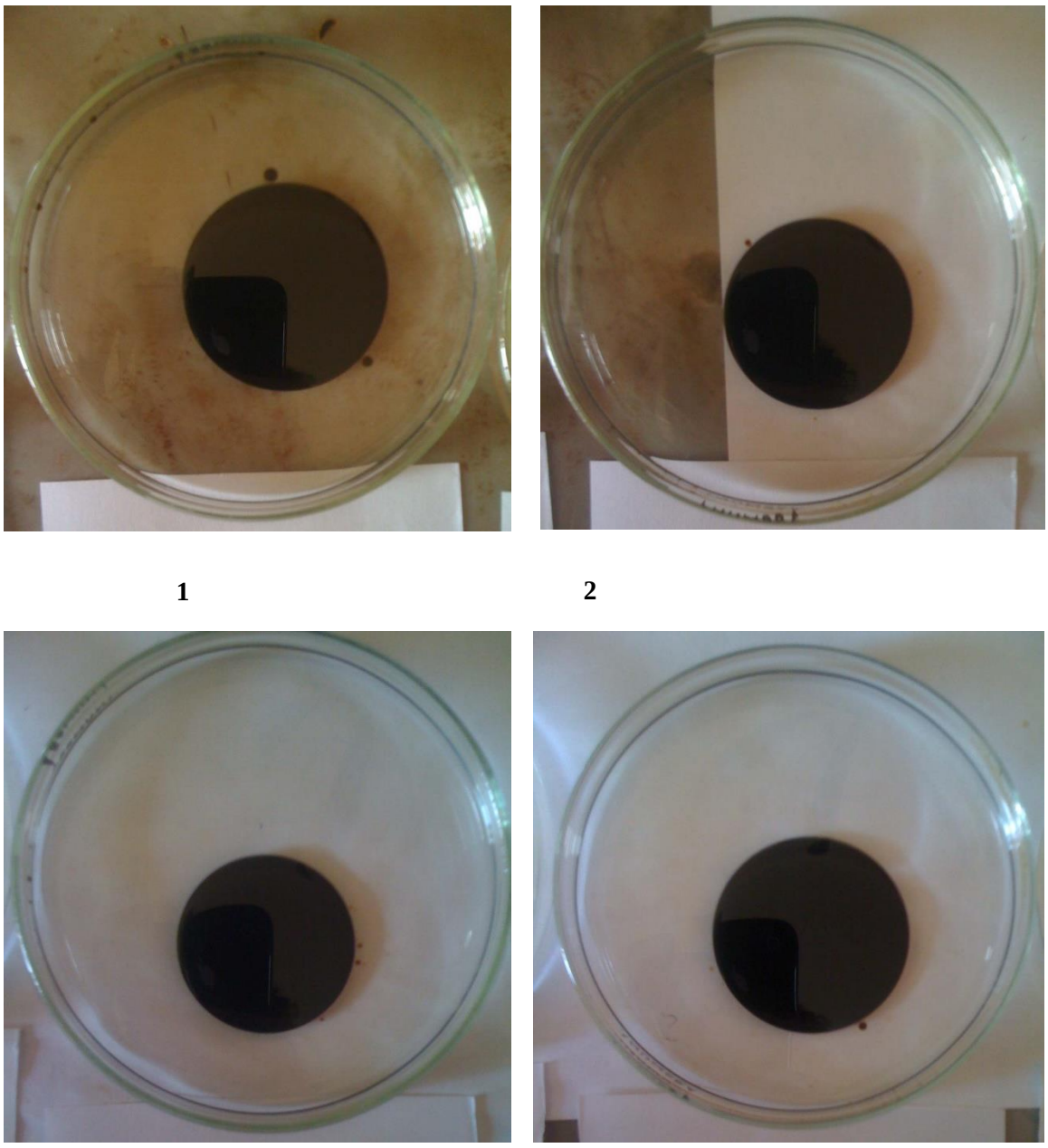
1



2

3

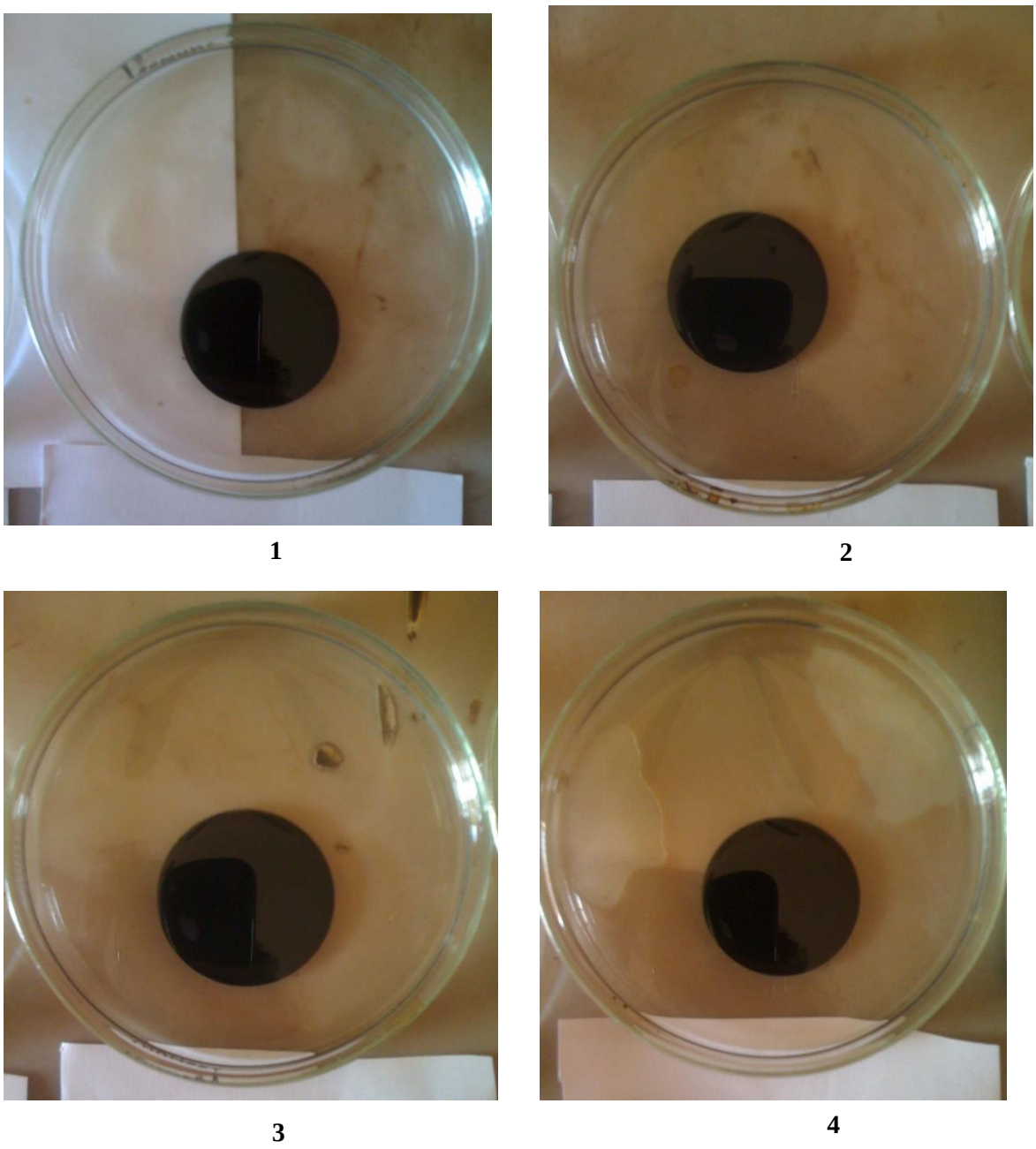
Figure 1. Pictures showing the properties of SNT oxyethers to collect oil from the water surface:
1. Pirallahi oil;
2. The effect of 0.02 grams of a 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:1 mol ratio of SNT and PO;
3. The effect of 0.02 grams of a 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:2 mol ratio of SNT and PO.



1 **2**

3 **4**

Figure 2. Pictures showing the ability of SNT oxyethers to collect oil from the water surface:
1. The effect of 0.02 grams of a 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:3 mol ratio of SNT and PO;
2. The effect of 0.02 grams of a 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:4 mol ratio of SNT and PO;
3. The effect of 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:5 mol ratio of SNT and PO;
4. Effect of a 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:6 mol ratio of SNT and PO.



1 **2**

3 **4**

Figure 3. Pictures showing the properties of SNT oxyethers to collect oil from the water surface:

1. The effect of 0.02 grams of a 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:7 mol ratio of SNT and PO;

2. The effect of 0.02 grams of a 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:8 mol ratio of SNT and PO;

3. The effect of 0.02 grams of 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:9 mol ratio of SNT and PO;

4. The effect of 0.02 grams of 5% solution of oxyphyrin in isopropyl alcohol obtained in a 1:10 mol ratio of SNT with PO.

1 **2**

3

Figure 4. Oil collecting properties from water surface of solutions of SNT complex with PEPA in 1:1 mol ratio in alcohols and glycol (water - 40 g, oil - 2 g):
1. Effect of 5% solution in ethyl alcohol
2. Effect of 5% solution in isopropyl alcohol
3. Effect of 5% solution in ethylene glycol

As can be seen from Figure 4, the oil-collecting properties of the solutions of the complex of SNT with PEPA in ethyl alcohol, isopropyl alcohol and glycol in a 1:1 mol ratio were studied. It was determined that the solutions have oil dispersing properties.
Thus, with the use of synthesized reagents, we can carry out the process of cleaning various oil-contaminated water bodies.