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[ijirset@gmail.com](mailto:ijirset@gmail.com)

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# Reducing the Viscosity of Jarkurgan High-Paraffin Oils with Surface Active Substances

**Salihova Ozoda Abdullaevna, Nurmonov Alisher Asliddin o'g'li**

Associate Professor of the Tashkent Chemical Technological Institute, Uzbekistan

Master student, Tashkent Chemical Technological Institute. The Republic of Uzbekistan

**ANNOTATION:** The aim of our work is to develop composite systems based on high and low molecular weight surfactants for cleaning various surfaces. The experimental work was carried out on a model system (quartz, glass), with an oil layer of the DZharkurgan field deposited on its surface. In our work, to clean the water surface from oil pollution, the effectiveness of the magnetic fluid was also studied.

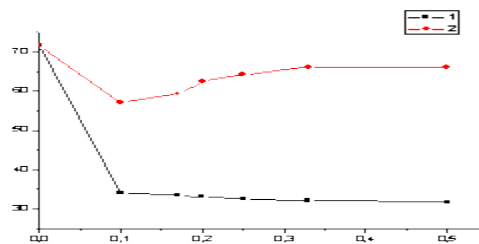
**KEYWORDS:** Sulfanol, polyethylene polyamine, kinetics of displacement of the oil substrate, composite system

In the oil-producing regions not only in Uzbekistan, but also in other countries, the problem of disposal of oil waste, processing of oily soils, washing of reinforced concrete and metal structures, and liquidation of oil spills is urgent. The solution of these problems requires new effective methods, new chemical reagents (surfactants, polymers, composite systems, etc.) to combat the consequences of oil spills, oil waste. The use of chemical reagents to solve the above problem is also important in theoretical terms in the process of secondary oil production (displacement by solutions of surfactants, polymers, etc.). Substantiation of the displacement mechanism makes it possible to select the optimal compositions of reagents, composite mixtures. The aim of the work is to develop composite systems based on high and low molecular weight surfactants for cleaning various surfaces. Composite systems are based on sulfanol and polyethylene polyamine (PEPA) in a ratio of 1: 1, 1: 2, 1: 3. The initial concentration of the components is 1%. It was found that at the indicated concentration, the solutions of the components have the lowest surface tension at the water-air interface ( $\approx 30-32$  mJ / m<sup>2</sup>) and at the water-oil interface ( $\approx 3-4$  mJ / m<sup>2</sup>). The detergent effect of the composite mixture was determined by applying a drop of solution to the clean solid surface / oil substrate interface and recording the displacement value (mm). Sulfanol was used as a surfactant. Sulfanol is a mixture of sodium salts, which are among the surfactants (detergents) that are highly soluble in water and have emulsifying properties, manufactured by Unilever Research Laboratory Port Sunlight, Birkenhead, Cheshire, England, molecular weight  $M_{\eta} = 222.24$  and more. The water-soluble polymer is polyethylene polyamine (PEPA). PEPA is a mixture of compounds containing fragments [-C<sub>2</sub>H<sub>4</sub>NH-] n, molecular weight  $MD_{\eta} = 4950$ . As a nonionic surfactant, oxyethylated alkylphenol OP-10 was used, which is an auxiliary substance, the product of processing a mixture of mono - and dialkylphenols with ethylene oxide and is used as a wetting and emulsifying surfactant, molecular weight  $M_{\eta} = 646$ , general formula



In the course of the study, magnetite was used, which is a black powder, the particle size is 74 microns. The experimental work was carried out using oil from the Dzharkurgan field. The detergent effect of the composite mixture was determined by applying a drop of solution to the clean solid surface / oil substrate interface. Oil substrates are formed on the surface of glass plates 3 - 2 cm in size. The displacement value (mm) was recorded for a certain period of time. For this model system, oil from the Zharkurgan field was used, the water content in the oil is 35%. The experimental work was carried out on a model system (quartz, glass), with an oil layer of the Dzharkurgan field deposited on its surface. Dean-Stark method found that the water content in oil is 35%. The individual components of the sulfanol and PEPA mixture differ in their surface activity at the water / air interface. Sulfanol noticeably lowers the surface tension ( $\sigma$ ) of water at a concentration of 0.1%; with a further increase in concentration, the value of  $\sigma$  decreases towards a constant value. The surface tension of aqueous solutions of PEPA with different concentrations indicates an insignificant surface activity of PEPA macromolecules ( $\sigma \approx 60-64$  mJ / m<sup>2</sup>). Such a weak activity is characteristic of all high-molecular surfactants, since the process of formation of the adsorption layer is determined by the rate of diffusion of macromolecules to the interface and the subsequent differentiation of their segments by polarity

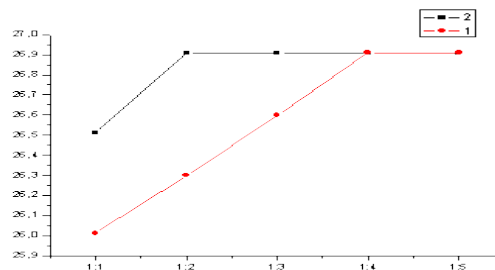
according to the Rebinde polarity equalization rule. The contribution of each of these factors to the formation of the adsorption layer of macromolecules depends on the nature, degree of hydrophobicity, and concentration of the polymer solution.



Sulfanol (1); PEPA (2)

Figure 1. Isotherms of surface tension of aqueous solutions of sulfanol (1) and PEPA (2)

The isotherm of the surface tension of composite systems is shown in Figure 7. There is a slight increase in  $\sigma$ , within  $0.9 \text{ mJ} / \text{m}^2$ , with an increase in the concentration of the added component in the composite mixture. Changing the status of components (main component, added component) does not significantly affect the surface tension. At the water / oil interface, sulfanol lowers the interfacial tension to  $15 \text{ mJ} / \text{m}^2$ , the composite system exhibits greater surface activity in comparison with individual sulfanol, and with an increase in PEPA concentration  $\sigma$  decreases to  $10 \text{ mJ} / \text{m}^2$ . The presence of an organic phase promotes the differentiation of component molecules at the interface and a decrease in the value of  $\sigma$ .



Sulfanol + PEPA (1); PEPA + sulfanol (2)

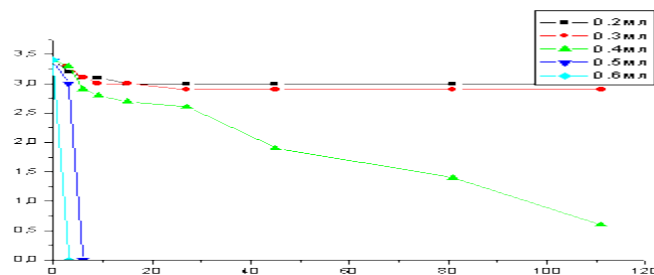
Figure 2. Isotherms of surface tension of composite systems based on sulfanol and PEPA

The next stage of our work was to study the washing action on oil substrates formed on the glass surface, both of individual components and of composite systems based on them. An individual 2% sulfanol solution has a good detergent effect: an increase in the displacement of the oil layer up to 20 mm within 11 minutes is observed with spontaneous spreading of a drop of solution. The advancing meniscus of the solution droplet ensures the diffusion of the complex macromolecules under the oil layer (washing action) and a decrease in the surface tension at the oil - aqueous solution of the complex interface. However, lowering the concentration to 1% significantly reduces the washing effect - the maximum displacement of the oil layer is 3.1 mm. The individual PEPA solution has a weaker detergent effect: an increase in the displacement of the oil layer up to 2-3 mm within 4 minutes. In general, the amount of displacement of the oil substrate is much larger for composite systems compared to individual components. In our work, the effectiveness of the magnetic fluid was also studied for cleaning the water surface from oil pollution. For the experiment, the smallest particles were selected, obtained by sieve screening (74 micron). The area of oil pollution depends on the volume of oil applied to the surface of the water. In our work, the volume of oil was 2 ml. The volume used for the dispersion of magnetic particles in kerosene was from 0.2 ml to 0.6 ml, the concentration of the magnetic fluid was 1%. After 10-15 minutes, kerosene penetrated into the oil layer and contributed to the uniform distribution of magnetite particles on the surface of the oil slick. After the specified time, the kinetics of the displacement of the oil layer under the action of the magnet was recorded. When the oil slick moves to the wall of the Petri dish, the slick may shift relative to the main direction of movement.

In this case, in some cases, there is a deviation from the shape of the spot of the correct circle. For a more accurate measurement of the displacement value, the counting was carried out from the wall of the Petri dish to the border of the spot. Therefore, over time, we did not have an increase in the magnitude of the displacement, but, on the contrary, a decrease. With an increase in the volume of the injected magnetic fluid, the value of the displacement (the distance from the wall of the Petri dish to the border of the oil slick) decreased from 3.3 to 1.7 cm. In this case, the most important characteristic is the time of maximum displacement.

The time to reach the maximum displacement is 133 min with the addition of 0.2 ml of magnetic fluid. With the introduction of 0.6 ml, the time to reach the maximum displacement is 5 minutes. When the oil layer is displaced, the surface of the treated water remains clean, without any residual oil streaks. In this experiment, it was difficult to achieve a uniform distribution of magnetic particles in the volume of kerosene. The adhesion of particles and their subsequent settling on the walls of the vessel is observed. To avoid the above effects, we modified dry dispersed magnetite particles with 2% aqueous solutions of sulfanol and OP-10. The holding time was 1 day, after which the particles were filtered off, dried in air, and then a magnetic fluid in kerosene was prepared from these particles.

No adhesion of the modified particles to each other and sedimentation on the walls of the vessel was observed; in the case of modified particles, the dependence on the volume of the injected magnetic fluid remained. With the volume of the magnetic fluid equal to 0.5 ml and 0.6 ml, the time to reach the maximum displacement drops sharply and amounts to 4 and 3 min, respectively, for a magnetic fluid with sulfanol-modified particles. Particle modification with OP-10 solution for the indicated volumes of magnetic fluid, the time to reach the maximum displacement is 4 and 2 min, respectively. By adjusting the size of the particles, the volumes of the injected magnetic fluid, and the nature of the modifying substance, it is possible to achieve maximum cleaning of the water surface.



**Figure 3. Kinetics of displacement of the oil layer on the water surface under the action of a magnetic fluid modified with a 2% sulfanol solution**

Thus, using various composite systems with a certain ratio of components, it is possible to carry out a complete cleaning of the solid surface from oil contamination. In the case of a liquid surface, cleaning with a magnetic fluid can be recommended.

### CONCLUSION

The surface activity of composite systems and individual components of this mixture has been studied. It was found that both individual components and compositions based on them exhibit high surface activity at the water / air interface (decrease in  $\sigma$  to 32 mJ / m<sup>2</sup>) and at the water / oil interface (decrease in  $\sigma$  to 4 mJ / m<sup>2</sup>). It is shown that the studied individual components and mixtures based on them have a detergent effect on oil substrates formed on the glass surface. The optimal ratios of the components to achieve the maximum washing effect have been established: sulfanol - PEPA 1: 2, PEPA - sulfanol 1: 4. It has been established that the elimination of oil pollution from the water surface can be carried out using a magnetic fluid. By adjusting the particle size, the volume of the injected magnetic fluid and the nature of the modifying substance, you can achieve maximum cleaning of the water surface. The studied composite systems can be recommended for cleaning the surface of solids, and magnetic fluids - for cleaning the surface of water bodies from oil pollution.

### REFERENCES

1. Ибрагимов Г.З., Фазлутдинов К.С. Применение химических реагентов для интенсификации добычи нефти. М.Недра, 1991. 384 с.



2. Козин В.Г., Шакиров А.Н., Шапошников Д.А. и др. Реагент для повышения нефтеотдачи пласта и состава на его основе // Вестник Казанского технол. ун-та. Серия химич. - 2000. - № 1-2. - С. 137-140.
3. Шакиров А.Н., Козин В.Г., Башкирцева Н.Ю., Шапошников Д.А. Реагент КС-6 для повышения добычи нефти // Нефтяное хоз-во. 2002. № 9. С. 64-66.
4. Шакиров А.Н., Жеглов М.А., Козин В.Г. и др. Новый реагент для повышения нефтеотдачи пластов // В сб.: Интенсификация химических процессов переработки нефтяных компонентов. - Нижнекамск: Нижнекамское кн. изд-во, 2001. - С. 104-107.
5. Хисамов Р.С., Ахметов Н.З., Кандаурова Г.Ф., Манапов И.З. Опытное применение водонабухающего полимера при очаговом заводнении // Нефтяное хоз-во. - 2003. - № 7. - С. 68-72.



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