Adsorption of surfactant binary mixtures at the oil-water interface

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To increase the efficiency of oil displacement from the surface of rock-forming minerals, surfactants should exhibit high surface activity at the oil-water interface and limited adsorption on the surface of rock-forming minerals [1, 2]. The aim of this work was to study the adsorption capacity of aqueous solutions of binary mixtures of anionic (alkylbenzenesulfonic acid and its sodium salt (ABSNa)) and nonionic surfactant (oxyethylated ester of anhydrosorbitol and fatty acids (OEFA)) on the oil-water interface before and after contact with a finely dispersed quartz surface. It was found that the ABSNa/OEFA mixture has a low adsorption capacity for quartz ($0.5 \cdot 10^{-7}$ mol/g), surfactant components after contact with it remain in solution and, therefore, are adsorbed at the oil-water interface, which is confirmed by a decrease in values of interfacial tension from 25 mN/m to 2.2 mN/m. After the establishment of adsorption equilibrium in the ABSA/OEFA/quartz system, the excess adsorption value is 6.8 times higher than this indicator for ABSNa/OEFA/quartz. The surface tension of the ABSA/OEFA solution after interaction with quartz reaches 65 68 mN/m, practically approaching the value of the surface tension of water (72 mN/m). This fact determines the low adsorption capacity of ABSA/OEFA at the oil-water interface in the presence of mineral material. The interfacial tension value decreases slightly – from 25 mN/m to 16.2 mN/m. The results obtained are confirmed by studies of the kinetics of oil displacement from the surface of quartz with AS/NS solutions and the calculated values of the activation energy of oil displacement.

References

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