

The Oil-Bearing Strata of Permian Deposits of the Ashal'cha Oil Field Depending on the Content, Composition, and Thermal Effects of Organic Matter Oxidation in the Rocks

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Abstract

© 2020 Galina P. Kayukova et al. The features of the oil-bearing capacity of the productive strata of Permian deposits in the interval of 117.5-188.6 m along the section of individual wells of the Ashal'cha field of heavy superviscous oil (Tatarstan) were revealed depending on the content, composition, and thermal effects of organic matter (OM) oxidation in the rocks. It is shown that the rocks are very heterogeneous in their mineral composition and in the content of both free hydrocarbons by extraction with organic solvents and insoluble OM closely associated with the rock. The total content of OM in rocks varies from 1.72 to 9.12%. The features of group and hydrocarbon composition of extracts from rocks are revealed depending on their mineral composition and the content of organic matter in them. According to the molecular mass distribution of alkanes of normal and isoprenoid structure, extracts from rocks are differentiated according to three chemical types of oil: type A1, in which n-alkanes of composition C14 and above are present, and types A2 and B2, in which n-alkanes are destroyed to varying degrees by processes microbial destruction, which indicates a different intensity of biochemical processes in productive strata of Permian sediments. These processes lead to a decrease in the amount of OM in the rocks and an increase in the content of resins and asphaltenes in the oil extracted from them, as well as an increase in the viscosity of the oil. Using the method of differential scanning calorimetry of high pressure, it was found that the studied rock samples differ from each other in quantitative characteristics of exothermic effects in both low-temperature (LTO) 200-350°C and high-temperature (HTO) 350-600°C zones of OM oxidation. The total thermal effect of destruction processes of OM depends on the content of OM in the rocks and its composition. The research results show that when heavy oil is extracted using thermal technologies, the Permian productive strata with both low and high OM contents will be involved in the development, and the general thermal effect of the oxidation of which will contribute to increased oil recovery.

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