

Regularities of the transformation of organic matter at great depths based on the results of deep and ultra-deep drilling in the north of Western Siberia

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Based on the results of geological and geochemical studies in deeply submerged Triassic sediments in the north of Western Siberia, zones of generation of hydrocarbons of different phase states were revealed. According to the basin modeling, the evolution of the catagenetic zonality of the Triassic depths, revealed by the Tyumenskaia (slaughter 7502 m), En-Yakhinskaia (8250 m), Yarudeyskaia (5010 m) and Gydanskaia (6126 m) wells, is established.

The development of oil and gas source formations enriched with type III organic matter has been substantiated in mid-Upper Triassic sediments with an increased potential for the generation of hydrocarbons.

When immersed to great depths, the oil and gas source and oil deposits fell into high temperature zones at which the petroleum hydrocarbons were subjected to thermal decomposition. There were complex processes of not only destruction, but also polymerization of hydrocarbon and heteroatomic components, causing the appearance of solid bitumen.

According to the results of the determination of the reflectivity of vitrinite and pyrolysis by the Rock-Eval method (T_{max}) for the north of Western Siberia, the depth limit for the existence of oil (the “deadline for oil”) is 4.5-4.9 km. Below there are significant prospects for the detection of gas condensates and gases, as evidenced by the intense gas shows in the sections of the studied wells.

The accumulation of solid bitumen in terrigenous rocks at depths of more than 5 km is a criterion for the development of the zone of destruction of oil in the prediction of oil and gas content. Despite the harsh catagenetic conditions, the gas generation potential of the oil and gas-mathemareous suites at depths of 6012-6191 m (Tyumenskaia well) and 6260-6504 (En-Yakhinskaia well) is not fully realized.

A detailed study of the newly identified generation zones in the Triassic will contribute to a more objective understanding of the processes of formation of petroleum potential at great depths.

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