

# Hydrothermal Impact on Hydrocarbon Generation from Low-Permeable Domanic Sedimentary Rocks with Different Lithofacies

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## Abstract

This study is intended to reveal the impact of hydrothermal treatments at temperatures of 200, 250, 300, and 350 °C on organic matter (OM) of low-permeable rocks of two different lithofacies types (carbonate and carbonate-siliceous rocks) from Domanic deposits of Upper Devonian Tatarstan. Autoclave experiments were carried out in a carbon dioxide environment. The content of OM and the yield of rock extracts, as well as the stability of kerogen structures to hydrothermal influences, were evaluated. The content of saturated hydrocarbons in the rock extracts increases after the hydrothermal transformation of kerogen and high-molecular-weight compounds, while the content of aromatic hydrocarbons and asphaltenes decreases. The results of molecular weight distribution of normal alkanes and isoprenoids show that rock extracts according to the classification of A. Petrov correspond to the A type of crude oil. Exposing hydrothermal factors on Domanic rocks at low and high temperatures provides more total extraction of hydrocarbons from rocks. The most intensive kerogen transformation process occurred at 350 °C. Hydrothermal impact on the carbonate rocks leads to almost complete transformation of kerogen with the formation of hydrocarbons, while in carbonate-siliceous rock samples, significant part of kerogen does not undergo transformation. The specific features of some biomarkers such as alkanes, aryl isoprenoids, steranes, and terpanes in petroleum products before and after hydrothermal treatment were discussed. The results indicate the general genetic nature of OM, but different geochemical conditions of its maturation in the sedimentary strata. Thus, steam injection leads to different hydrocarbon generating potential from different reservoir rocks.

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