

**MATHEMATICAL MODELING OF THE HYDROCARBON GENERATION AND MIGRATION PROCESSES IN THE SOUTH OF THE MANSI SYNECLISE (WEST SIBERIA)**

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The study area is located in the southern part of the Mansi syneclise which is one of the largest areas of hydrocarbon generation in West Siberia (Fig. 1). The prospect is about 12 000 km<sup>2</sup> in area.

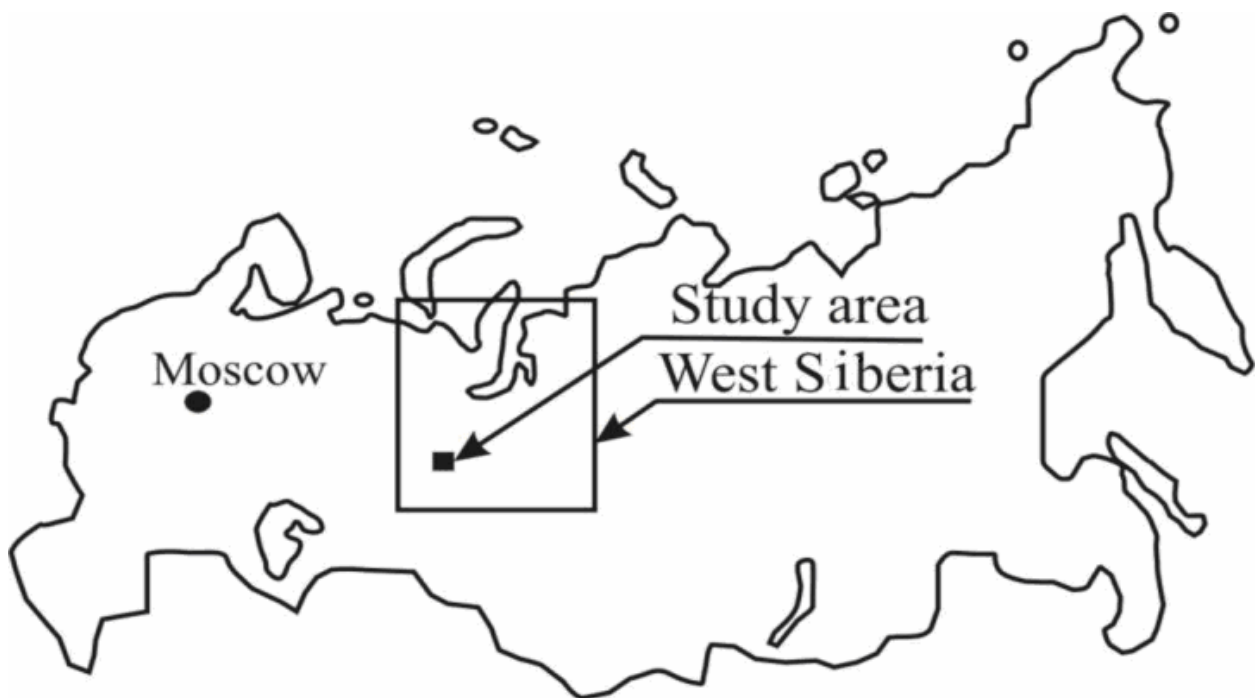


Figure 1. Study area position.

The entire Mesozoic-Cenozoic section of the study area is divided into 21 intervals, corresponding to individual lithostratigraphic complexes. The Cenozoic part of the section is divided into 5 intervals. The absolute ages were accepted according to the stratigraphic scale approved at the XXXIth Geological Congress. A set of lithologic maps has been constructed for each complex. The following major groups of rocks have been identified: sandstones and coarse-grained siltstones, fine-grained siltstones and mudstones, coals.

The assumption that the Bazhenovo Formation is the major oil source formation is the most valid. There is a sufficient amount of consistent determinations of kinetic parameters, including those performed by the authors, which are well concordant with kerogen type II.

Based on pyrolytic studies, the initial generation potential of kerogen of the Bazhenovo Formation in the region is about 500 mg HC/g TOC, at that the HC amount before the beginning of thermal transformations was about 35 mg HC/g TOC. Thus, the initial generative potential was assumed to be 535 mg HC/g TOC for modeling. The initial organic carbon content in the deposits of the Bazhenovo Formation is 6-8% in this region.

The variations of the modern heat flow at the bottom of the sedimentary cover range from 45 to 79 V/m/K, averaging 62 V/m/K, which is slightly lower than the initial heat flow at the time of the onset of formation of the sedimentary cover. The reconstructed thermal history of the deposits is well consistent with data on vitrinite reflectance, the present-day temperature, and heat flow.

The program complex Temis 3D of Beicip-Franlab Company was used for modeling of the processes of hydrocarbon generation and migration in the southern part of the Mansi syncline.

Based on geologic-geophysical and geochemical data, the dynamics of submergence of the deposits into the oil window was reconstructed, and the spatial location of the centers of oil generation and the amount of liquid hydrocarbons, which migrated from the deposits of the Bazhenovo Formation, were determined. Thus, the area of the centers of oil generation accounted for no more than 10% of the total area of the study area (about 1200 km<sup>2</sup>) at the time of formation of the top of the Kuznetsovo Formation, but it had reached almost 30% by the end of the Late Cretaceous. At the time of formation of Rupelian deposits, the deposits of the Bazhenovo Formation have reached the oil window in the most part of the study area. By the recent time, the deposits of the Bazhenovo Formation had reached the oil window throughout the entire study area.

On the whole, an “inversion” type of submergence of the deposits into the oil window was established, i.e., in the uplifted parts hydrocarbon generation started simultaneously or slightly earlier than in the depressions.

In the most heated areas, the amount of hydrocarbons, which migrated from the deposits of the Bazhenovo Formation, was more than 80 mg HC/g of rock. Hydrocarbon migration exceeded 30 mg HC/g of rock in the eastern part of the area and 50 mg HC/g of rock in the western part.