



New results of studying of the Devonian shale formation in the Volga-Ural region

Irina Plotnikova, Nikita Pronin, Vladimir Morozov, and Fidania Nosova
Kazan Federal University, Kazan, Russian Federation (irena-2005@rambler.ru)

The objects of the study are Upper Devonian carbonate rocks in the territory of South-Tatar arch and Melekes basin in the Volga- Urals region. We studied core material and organic matter of Domanicoid facies from the sediments of Semilukskiy and Rechitskiy (Domanik) horizons of the Upper Devonian.

Basic analytical research methods included the following: study of the composition, structural and textural features of the rocks, the structure of their voids, filter and reservoir properties and composition of the fluid. The complex research consisted of macroscopic description of the core material, optical microscopy analysis, radiographical analysis, thermal analysis, x-ray tomography, electron microscopy, gas-liquid chromatography, chromate-mass spectrometry, isotopic analysis of oil and organic matter, light hydrocarbons analysis using paraphase assay, adsorbed gases analysis, and thermal vacuum degassing method. In addition, we performed isotopic studies of hydrocarbons saturating shale rocks.

The study of biomarkers was carried out with the help of chromato-mass spectrometry in the Laboratory of Geochemistry of Fossil Fuels, Kazan Federal University.

GC/MS method was used in oil to investigate the individual composition of naphthenic hydrocarbons, primarily steranes and terpanes and another new biological markers. In this study we used several informative parameters characterizing the depositional environment, the type of source OM and its maturity. In the evaluation of the facial conditions of sedimentation and the degree of catagenetic conversion of the OM, the quantitative characteristics based not only on the distribution of steranes and terpanes, which are related to the lithology and maturity of the OM. New biomarkers parameters (carotenoids) were used to study the conditions of formation of shale strata. Based on these new data, a new model of geological and environmental conditions for the formation of shale strata saturated bituminous matter (organic matter).

Organic matter is characteristic mainly of the most siliceous formations. In "pure" carbonates, which are represented by micro-layers with different capacities, OM is not observed at all or its content is quite low.

We found a connection between the type of organic matter and the composition of adsorbed gas. The study of adsorbed gases show the following: all samples have increased, high and abnormally high concentration of selected gases. Their common characteristic is that the gases are heavy, fatty, and have low methane content and hydrocarbons of unsaturated series (ethylene, propylene and butylene). Heavy hydrocarbons of saturated series are dominating, their share is changing irregularly in the homologous series.

The use of aromatic carotenoids and alkyl toluenes can restore paleo facies conditions of sedimentation of the Domanik strata and paleo geodynamics of the part passive continental margin of the Baltica Late-Proterozoic continent.