

FAMILY OF FLUIDS OF THE KRASNOLENINSKY ARCH FIELDS ACCORDING ISOTOPE AND MOLECULAR GEOCHEMISTRY

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The Krasnoleninsky Arch is located in the west of the Khanty-Mansiysk region (Western Siberia, Russia) and includes Talinskoe field, Em-Yogovskoe field, Kamennoe field, Palyanovskoe field and others. Fields have a giant reserves. The wide stratigraphy of oil and gas potential makes it special compared to many fields surrounding territories. Major oil and gas reservoirs are in the pre-Jurassic, Jurassic and Cretaceous. At that, if the nature of the Upper Jurassic and Cretaceous oil is little doubt it arose (it is considered that most of it was generated by organic matter of the Bazhenov Formation (Kontorovich et al., 1995; Moskvina et al., 2004; Goncharov et al., 2016)), the origin of the oil and gas in Lower-Middle Jurassic and pre-Jurassic reservoirs is still not clear.

The isotopic and molecular composition of oil and gas (80 samples) from wells and reservoirs of Talinskoye field has been studied by us. According to the results of gas samples studies have found that they can be divided into two families (Figure 1). The first family includes gases with the most light isotope composition of carbon ($\delta^{13}\text{C}$ propane = -40.9 ... -35.9 ‰, $\delta^{13}\text{C}$ n-butane = -38.4 ... -35.6 ‰, $\delta^{13}\text{C}$ of n-pentane = -36.0 ... -33.1 ‰), relating to reservoirs UK₀-UK₆ (Upper and Middle Jurassic). These values are typical for the $\delta^{13}\text{C}$ gases south-eastern and central parts of Western Siberia, generated by organic matter of the Bazhenov Formation and its age-peers (Tutleymskaya Formation). The second family gases – with a heavy isotope of carbon ($\delta^{13}\text{C}$ propane = -34.2 ... -30.4 ‰, $\delta^{13}\text{C}$ n-butane = -33.1 ... -30.6 ‰, $\delta^{13}\text{C}$ of n-pentane = -31.8 ... -29.7 ‰), it included gases from reservoirs UK₇-UK₁₁ (lower and middle Jurassic) and the pre-Jurassic. It is related to another source, stratigraphic confinement of which is not yet clear. A gas sample from a well 11116 (Lower Jurassic reservoir UK₁₀) stands out among the other and has a most isotopically heavy carbon. Probably, this gas was generated by the same source as the 2nd gas family, but at late thermal maturity. Although we cannot exclude the possible contribution of the third source. A similar isotopic composition of carbon also we have been found for components of several gases from wells of Palyanovskoe field.

The presence of two major groups of gases is well correlated with the molecular composition of crude oils. The main differences of the two oil families reflected in the values of facial parameters Pr/Ph, (m+n)/o-xylene, ethylbenzene/xylene, as well as in the change character of the molecular parameters of thermal maturity (4MDBT/1MDBT, MPI-1). Oils of two families are almost identical in biomarker composition (steranes, hopanes), which indicates a very close conditions of accumulation and the type of initial organic matter, which served as a source for them. The similarity of the isotopic composition of the 2nd family gases from the Krasnoleninsk Arc and Palaeozoic gases in the south-east of Western Siberia can indicate the existence the same type of source. However, signs of the Paleozoic (a significant predominance of C29 steranes content over steranes C28, a unique composition of long-chain n-alkyl benzenes and other indicators) is not detected in the composition of the oils. On the other hand, the increased ratio Pr/Ph and (m+n)/o-xylene and stratigraphic position of a 2nd

family fluids reservoir on Talinskoe field mainly in Lower and and pre-Jurassic rocks suggesting that the source for these fluids probably lies here.

The observed patterns of distribution of fluids of different families on Talinskoye field find their explanation in the geological structure. Talinskoye field stands consistency of thickness of Lower and Middle Jurassic sediments at the level of 150-300 m in relation to other areas (Em-Egovskoe, Kamennoye, Palyanovskoye fields), where the Jurassic section is essentially decrease sediment thickness in general and in some wells Upper Jurassic Bazhenov Formation lies directly on the pre-Jurassic basement. This feature of Talinskoye field almost completely eliminates the possibility of secondary downward migration of oil from the Upper Jurassic Bazhenov Formation in the Lower and Middle Jurassic rocks horizons and the possibility of its influence on the composition and properties of fluids there.

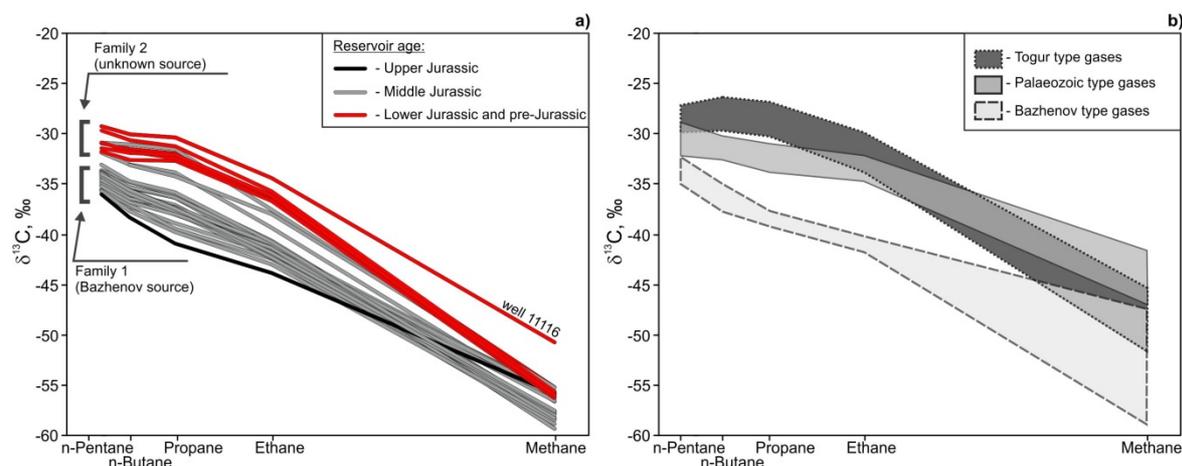


Figure 1 The isotopic composition of carbon components for gases families of Talinskoe field (a) in comparison with division gases in the genetic types in the southeast of Western Siberia (b) according to (Goncharov et al., 2012 with changes and additions).

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