

## CARBON ISOTOPIC COMPOSITION OF EXTRACTS FROM THE ROCKS OF THE BAZHENOV FORMATION OF VARIOUS CATAGENESIS

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In the practice of regional geochemistry of carbon isotope composition is a proven correlation parameter. This is due to the fact that it reflects, on the one hand, the genetic nature of the organic matter (OM), and on the other, during the process catagenesis (Galimov, 2006). For oil-oil correlation and oil-OM correlation determined the carbon isotope composition of oils and extracts from source rocks, and their individual chromatographic fractions that differ in polarity (Galimov, 2006; Lopatin, 1992).

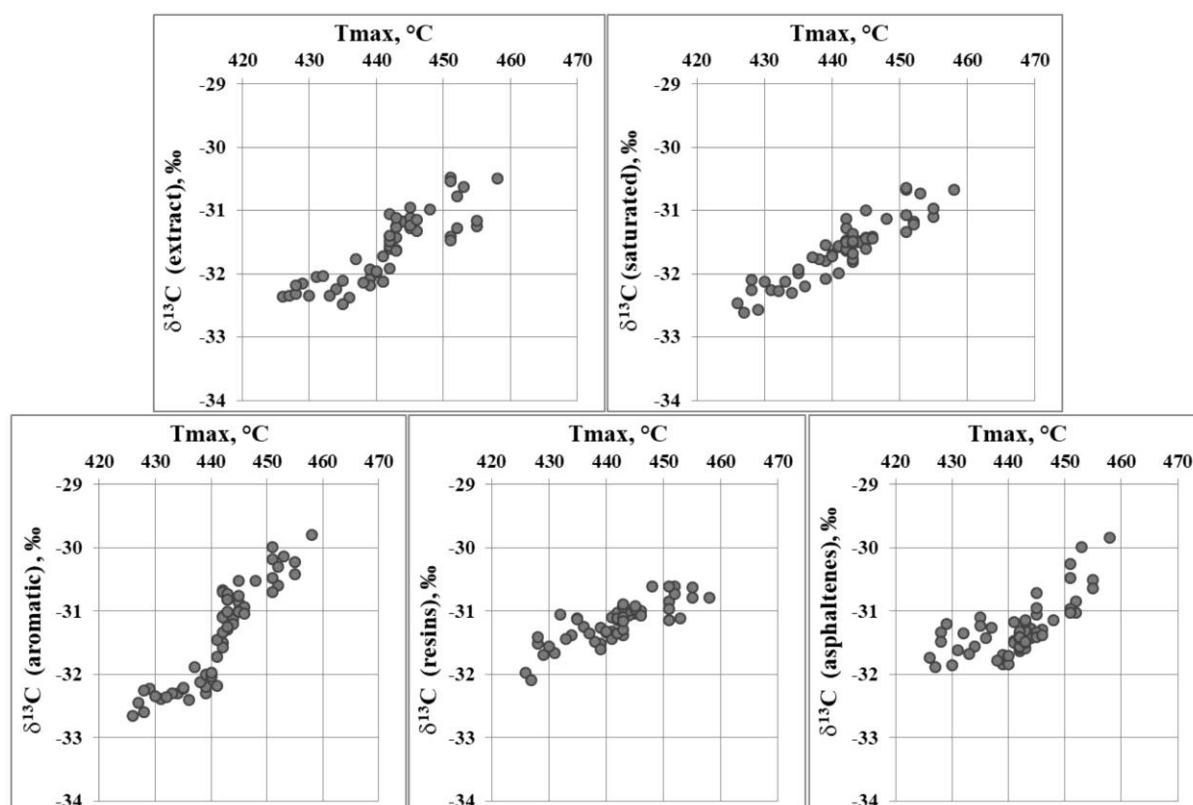
The Bazhenov formation is the main oil source in the West-Siberian oil-and-gas province. These rocks are represented by highly bituminous, silica-argillo-carbonaceous deposits formed in the conditions of maximum Late Jurassic-Early Cretaceous transgression of the sea basin. Data on the carbon isotopic composition of extracts from the rocks of the Bazhenov Formation, as well as the carbon isotopic composition of crude oils formed by these rocks are presented in many publications. However, in the overwhelming number of publications, the determination of carbon isotopic composition was performed for whole oils and extracts, and data are presented without comparison with the level of catagenesis of OM in rocks of the Bazhenov Formation. Besides carbon isotopic composition of the extracts studied to a lesser extent and less regularly than crude oils.

In general, the published data we can say that in the extracts from the rocks of the Bazhenov Formation carbon isotope composition varies from -34 ‰ to -28 ‰ with the most common values of -32 ‰ ... -30 ‰ (Kontorovich, 1986). This range corresponds to the oil generated by rocks of the Bazhenov Formation, for which the carbon isotope composition ranges from -30.1 ‰ to -32.6 ‰ (Peters, 1994).

We have made geochemical studies of rocks Bazhenov Formation from 14 wells in the central part of Western Siberia (Salym and adjacent territories). In the section of the Bazhenov formation of each well, samples were taken for research through 0.5-1.0 m. Pyrolytic analysis was performed for all samples (Rock-Eval 6). According to the results of pyrolysis, 4-5 of the most representative samples were selected from each well. For these samples, a complex of geochemical studies was performed: chloroform extraction, SARA analysis, GC/MS analysis of saturated and aromatic fractions, carbon isotope analysis of extracts and their fractions.

Pyrolytic analysis (Rock-Eval 6) showed that the average content of organic carbon (TOC) for the rocks of the Bazhenov Formation and its analogues is from 3% to 15%. Catagenesis source rocks varies from the early stage (Tmax 420-430 °C) to the late stage of oilwindow (Tmax 455-460 °C, Salym region). Molecular parameters characterizing the facial-genetic type of OM indicate that in this region the rocks of the Bazhenov formation had extremely close conditions of sediment accumulation of OM: C<sub>29</sub>/C<sub>27</sub> Steranes 0.80-1.05, Pr/Ph 0.75-0.95, C<sub>35</sub>/C<sub>34</sub> Hopanes > 1.0, 4MDBT/Phen 0.9-1.3. The average values of the hydrogen index (HI) for each well have a clear dependence on the catagenesis parameters (Tmax, molecular parameters). At the same time, the initial values of the hydrogen index (HI<sub>0</sub>) for the OM of the Bazhenov Formation in this region were 690-710 mg HC / g TOC.

The results of isotope investigations (Delta V Advantage) revealed that the extracts from the rocks carbon isotope composition in a range from -32.5 ‰ to -30.5 ‰ and is dependent on catagenesis. (fig.). It is noteworthy that the fractions have a different character of changes in the isotopic composition of carbon with an increase in catagenesis (Tmax). For saturated hydrocarbons and resins, the change in carbon isotopic composition is systematic with an increase in the Tmax parameter in the range from 425 to 460°C. The carbon isotopic composition of the aromatic fraction, as well as the extracts, most rapidly increases from a Tmax value of 440°C. The carbon isotope composition of asphaltenes is practically unchanged to a Tmax value of 445 °C, and only with more catagenesis does it begin to change. The nature of the change in carbon isotopic composition for fractions determines the change in the type of isotopic curve (saturated - aromatic - resins - asphaltenes) for extracts from rocks of the Bazhenov formation at different stages of catagenesis.



**Figure 1** The change in carbon isotopic composition of extracts from the Bazhenov formation and their fractions with an increase in catagenesis

## References

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