

SPECIFIC LAYERS CONTAINING HIGHLY OIL-PRONE ORGANIC MATTER IN THE BAZHENOV FORMATION

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The Bazhenov formation is one of the largest oil shale formation in the World. It was formed during 8-10 million years in late Jurassic – early Cretaceous periods (Gurari *et al.*, 1963, Kontorovich *et al.*, 2016). Accumulation and conservation of organic matter took place at the maximum transgression of the paleo-sea basin with high biological productivity at low sedimentation rate.

Geochemical studies performed by N.V. Lopatin, E.M. Galimov, I.V. Goncharov, M.V. Dakhnova, G.A. Kalmykov, M.Yu. Zubkov and others were focused on characterization of organic carbon content, chemical composition, maturity of organic matter and generation potential of the Bazhenov formation. The deposits mostly consist of carbonate-clayey-silica rocks enriched in marine organic matter. Average total organic carbon (TOC) content is 8÷9 wt. %, initial hydrogen index is 715 mg HC/g TOC (Kozlova *et al.*, 2017).

The objective of the paper is to perform a comprehensive study of core samples from very specific fluorescent layers enriched in organic matter with extremely high (for the Bazhenov formation) present-day hydrogen index (HI), which were found in more than 15 wells within the Bazhenov play. These wells are located in the central part of the West Siberian petroleum basin.

The work included lithological, petrographic and geochemical studies (Rock-Eval pyrolysis, bulk kinetics of kerogen decomposition, elementary and FTIR analysis).

Lithological and petrographic examinations shows that studied layers contain a high amount of fluorescing alginite components, which is not typical for kerogen-clayey-silica host rocks of the Bazhenov formation.

Table 1 shows geochemical parameters of core samples from the specific intervals compared to host rocks where these layers were found.

Table 1.

The Rock-Eval parameters of investigated samples

Well	Sample	TOC (wt. %)	Tmax (°C)	HI (mg HC/g TOC)	GOC/TOC (%)
1	Specific layer (5 cm)	9.87	453	788	69
	Range and average values for host rocks	<u>1.84÷15.97</u> 7.69	<u>440÷447</u> 443	<u>235÷579</u> 434	<u>22÷50</u> 38
2	Specific layer (4 cm)	11.68	451	900	77
	Range and average values for host rocks	<u>1.93÷19.02</u> 10.92	<u>430÷445</u> 437	<u>347÷716</u> 588	<u>32÷61</u> 51

According to the pyrolysis data, the layers are characterized by extremely high HI up to 900 mg HC/g TOC and GOC/TOC up to 77 %. The FTIR analysis of the layers showed the predominance of aliphatic chains bonds in the structure of organic matter over aromatic structures, which correspond to high H/C ratio (up to 1.70).

According to the bulk kinetic studies of the thermal decomposition of kerogen from the specific layers, the activation energy spectrum consists of single energy $E_a=53$ kcal/mol (Fig. 1) which is typical for type I kerogen, compared to activation energy spectrum of type II kerogen, which consists of several E_a values in the interval from 48 to 60 kcal/mol.

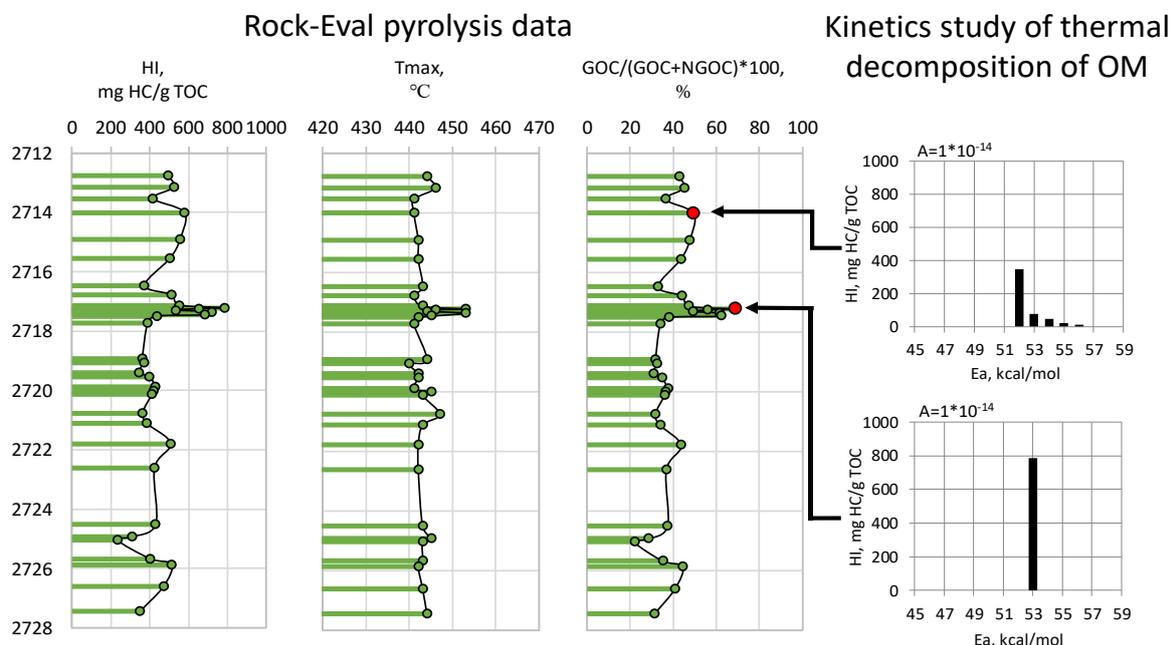


Figure 1 Characteristics of organic matter based on pyrolysis and kinetic studies for section in well 1

The observed parameters of the studied intervals indicate specific genesis of organic matter and/or unusual conditions of marine sedimentation in the paleo-sea basin. The origin of alginite-rich rocks in the central part of the Bazhenov formation is questionable. A possible explanation is high amount of algae and high bacterial productivity in areas of upwelling or areas of methane-seeps on the sea-bottom.

This study provides new insight into the genesis and sedimentation conditions of organic matter for the Bazhenov formation. Fast recognition of studied fluorescing intervals makes them useful for section correlation of neighborhood wells.

References

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