

## ORGANIC GEOCHEMISTRY OF MIDDLE CAMBRIAN BLACK SHALES FROM THE CHEKUROVKA ANTICLINE OF THE SIBERIAN PLATFORM

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### Introduction

The carbonate, clay-siliceous deposits of the Sektenskaya (Sekten) Formation enriched in organic matter (OM) have been accumulated in the Middle Cambrian in the northeast of the Siberian platform [Bakhturov et al., 1988 and others]. They represent facies analog the Kuonamka Formation. The OM from the Sektenskaya Formation was not studied with the use of pyrolysis, chromatography-mass-spectrometry. The goal of this investigation is to specify the generation potential, the maturation of OM, the hydrocarbon (HC) composition of OM from rocks of the Sektenskaya Formation and the conditions of their formation in the slope of the Chekurovka anticline (northeast of the Siberian Platform).

### Results

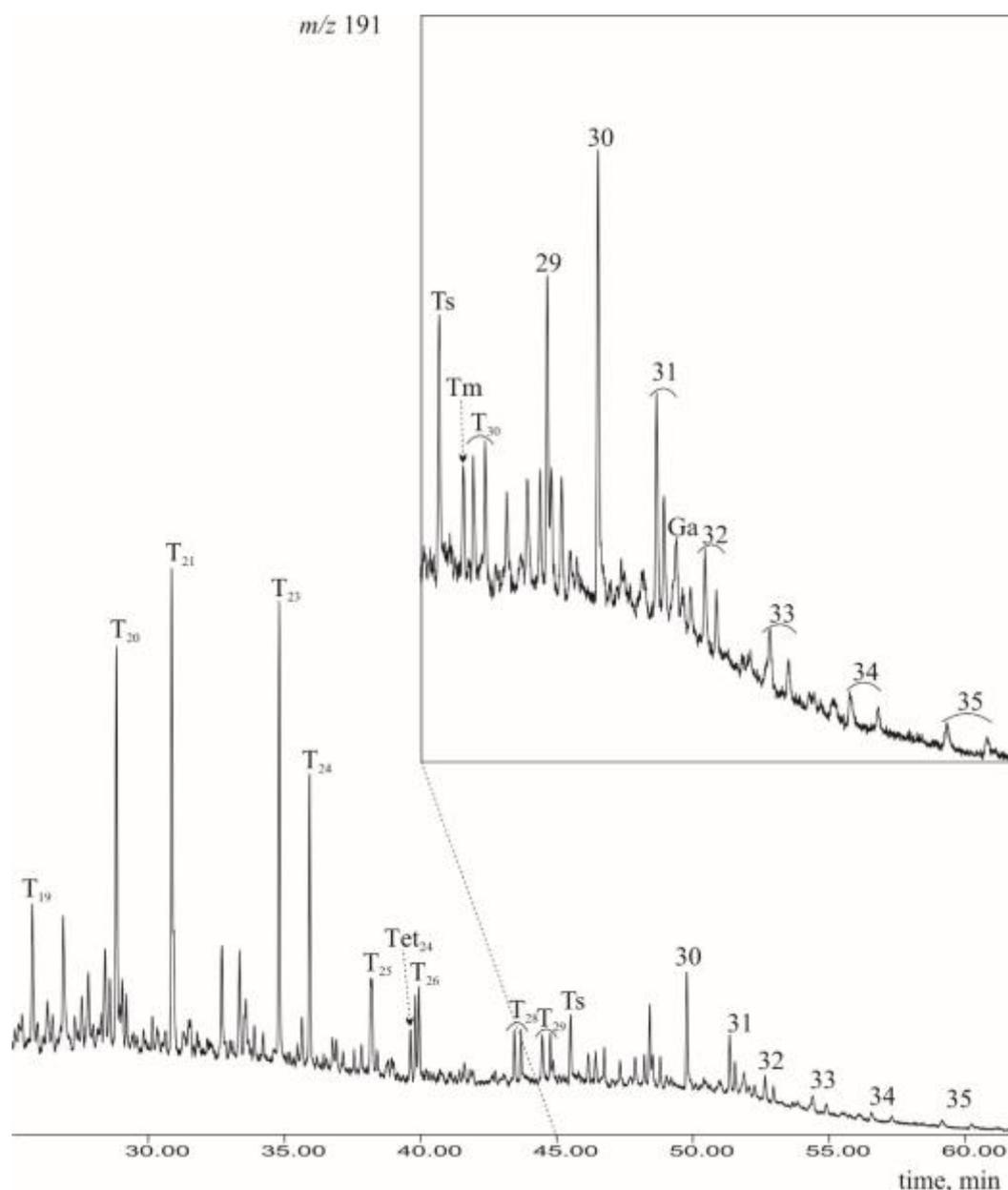
The organic carbon content (TOC) changes considerably in the rocks of the Sektenskaya Formation. TOC of organic-rich rocks varies from 1.1 to 4.7 %. TOC of organic-poor rocks varies from 0.01 to 0.36 %. In this work, only OM-rich rocks have been considered. Pyrolysis parameters of these rocks change significantly. The content of the “bituminous” component (S<sub>1</sub>) is found within the values range from 0.01 to 0.03%, while the “kerogen” constituent part (S<sub>2</sub>) accounts for 0.13-0.50 %. Production index (PI=S<sub>1</sub>/(S<sub>1</sub>+S<sub>2</sub>)) varies from 0.04 to 0.11. The Sektenskaya Formation source rocks have low hydrogen index (HI) values, HI changes from 69 to 202 mg HC/g TOC. T<sub>max</sub> of rocks varies from 444 to 451 °C. Isotopic composition of organic carbon (δ<sup>13</sup>C) of rocks varies from -29.6 to -31.7‰.

The common molecular properties of OM from Middle Cambrian rocks of the Sektenskaya Formation in the northeast of Siberian platform are considered to be:

- 1) maximum in alkanes abundance of normal structure in the area of n-C<sub>16</sub>-n-C<sub>19</sub>, usually;
- 2) pristane vs phytane and even vs odd n-alkane ratios approximate 1.3 and 1.2;
- 3) absence of 12- and 13-monomethylalkanes;
- 4) presence of n- and iso-alkane, sterane and terpane HCs in saturated HCs fractions;
- 5) higher ethylcholestane concentrations, as a rule (C<sub>29</sub>/C<sub>27</sub> = 1.2), rarely C<sub>29</sub>/C<sub>27</sub> = 0.9;
- 6) (tricyclic terpanes)/hopanes ratio is higher than 3.2 (fig. 1);
- 7) C<sub>29</sub>/C<sub>30</sub> hopane ratio is less than 1;
- 8) abundance of tricyclic terpanes with maximum T<sub>21</sub>, T<sub>23-26</sub> contents (fig. 1), and the tricyclic index  $2 \cdot \sum(T_{19-20}) / \sum(T_{23-26})$  (by Kontorovich et al., 1999) being less than 1;
- 9) gammacerane contents averages 1% in terpanes for m/z 191 (fig. 1);
- 10) the C<sub>35</sub>/C<sub>34</sub> homohopane ratio varies from 0.7 to 1.2;
- 11) the ratio of geo- and bio-stereoisomer steranes 20S/(20S+20R) averages 0.4;
- 12) the Ts/Tm ratio varies from 1.4 to 4.7 (!).

### Conclusions

For the first time, it has been established that the Sektenskaya Formation comprises four levels of organic-rich rocks. Pyrolysis study showed that their generation potential on the slopes of Chekurovskoy anticline is almost exhausted. Bitumen and molecular parameters indicate that the level of maturation of OM rocks corresponds to oil window or higher (MK<sub>2</sub> (peak mature of OM) may border MK<sub>2</sub>-MK<sub>3</sub> (late mature of OM) by A.E. Kontorovich (1976)).



**Figure 1.** Typical mass-chromatograms for  $m/z$  191 of saturated HCs of bitumens:  $T_{19-30}$  – tricyclic terpanes,  $Tet_{24}$  – tetracyclic terpanes,  $Ts$  – trisnorneohopane;  $Tm$  – trisnorhopane; 29 – neohopanes, 30 – hopane, 31–35 – homohopanes;  $Ga$  – gammacerane.

It has been established that the organic-poor carbonate and siliceous rocks of the Sektenskaya Formation may contain migrated bitumens. It is assumed that accumulations of oil or bitumen, genetically related rocks of the Kuonamka Formation and their analog may be found in the traps of Cambrian and Permian sediments on the northern slope Olenek uplift and adjacent areas.

## References

- Bakhturov S.F., Evtushenko V.M. and Pereladov V.S. (1988) Kuonamka bituminous carbonate-shale formation [in Russian]. Novosibirsk, Nauka, 160 p.
- Kontorovich, A.E. (1976). The Geochemical Methods for the Quantitative Prediction for Petroleum Presence [in Russian]. Nedra, Moscow. 249 p.