

**ORGANIC GEOCHEMISTRY AND OIL GENERATION POTENTIAL OF  
KUONAMKA COMPLEX IN CAMBRIAN DEPOSITS  
FROM SIBERIAN PLATFORM**

Tatyana M. PARFENOVA, Alexey E. KONTOROVICH, Vasiliy N. MELENEVSKY,  
Natalya V. AKSYONOVA, Yelena A. ZUBOVA, Yelena N. IVANOVA and  
Nadezhda T. YUDINA

*Institute of Petroleum Geology and Geophysics SB RAS,  
Acad. Koptug Av., 3, Novosibirsk, 630090, RUSSIA, [ParfenovaTM@uiggm.nsc.ru](mailto:ParfenovaTM@uiggm.nsc.ru)*

In Botomian, Toyonian, and Amginian stages of Cambrian Age there accumulated deposits enriched with organic matter (OM) in the east and north of Siberian platform. They formed one of the main oil producing series in this area. Their clayey-carbonaceous-silica rocks aggregated in Kuonamka complex – the Kuonamka Formation (Kontorovich, Savitsky, 1970, Bakhturov et al., 1988). Recently there was given start to the detailed and systematic study of OM from these deposits with the use of pyrolysis, gas-and-liquid chromatography and chromatography-mass-spectrometry, and electronic paramagnetic resonance methods (Kashirtsev, 2003, Parfenova et al., 2004, Kontorovich et al., 2005a).

Content of organic carbon ( $C_{org}$ ) changes considerably in the rocks of Kuonamka complex. Minimal values of  $C_{org}$  concentrations amount to 1-3%. As a rule, they typify carbonaceous and silica rocks. Abnormally high  $C_{org}$  content is attributed to combustible shales. Pyrolysis parameters of rocks change dramatically. The content of the “bituminous” component  $S_1$  is found within the bounds of values 0.06-0.25%, while the “kerogen” constituent part  $S_2$  constitutes 0.75-6.52%. Productivity index ( $PI=S_1/(S_1+S_2)$ ) varies from 0.02 to 0.09. The deposits of Kuonamka complex have high hydrogen index (HI) values, from 300 to 600 mgHCs/g  $C_{org}$  and more. Temperatures of maximum yield of HCs fluctuate within 426-444°C. Isotopic composition of  $C_{org}$  ( $\delta^{13}C$ ) of rocks varies from -29.8 to -34.2‰, while carbon isotope contents of the studied butumens fall within the span of -29.9 – -34.4‰. Resin and asphaltene components of OM of carbonaceous rocks from Kuonamka complex have super-fine structure of electronic paramagnetic resonance spectrums. Such a structure is formed by quadrivalent vanadium within vanadyl porphyrins.

Apart from the mentioned above, the common molecular properties typifying OM of Lower and Middle Cambrian rocks in the east 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>; 2) pristine vs phytane and even vs odd n-alkane ratios approximate 1; 3) absence of 12- and 13-monomethylalkanes in notable concentrations; 4) presence of n- and iso-alkane, cyclohexane,

sterane and terpane HCs in methane-naphthane fractions; 5) higher ethylcholestane concentrations; 6) abundance of tricyclanes with maximum C<sub>21</sub>, C<sub>23-26</sub> contents, and the tricyclane index being less than 1; 7) gammacerane contents averages 1% in terpane fraction; 8) the ratio of geo- and bio-stereoisomer steranes 20S/(20S+20R) averages at 0.5, while moretane ratio (C<sub>32S</sub>/C<sub>32R</sub>) approximates 1.

These features of the syngenetic OM of rocks prove that their sources were algae and bacterial organisms of the sea with normal salinity. The level of thermal maturation of OM is consistent with the initial stage of mesokatagenesis of the main zone of oil generation and arbitrary prove the rocks from Kuonamka complex to be potential in oil generating. The estimation of oil generating potential of the variously enriched with OM clayey, silica and carbonaceous rocks speaks for their high oil generating properties. Judging by the mentioned characteristics, the OM of the Cambrian Kuonamka complex differ considerably from oils of the Riphean, Vendian and Paleozoic of sedimentary basins in North-Asian craton (Kontorovich et al., 2005b). Oils generated there will also possess notable distinguishing features in terms of biomarkers, and contents of vanadyl porphyrins and  $\delta^{13}\text{C}$ .

*This work was supported by the Russian Foundation for Basic Research (project no. 06-05-64209).*

## REFERENCES

- Bakhturov S.F., Evtushenko V.M. and Pereladov V.S. (1988) Kuonamka bituminous carbonate-shale formation. *Novosibirsk, Nauka*, 160 p.
- Kashirtsev V.A. (2003) Organic geochemistry of naphthides of the eastern Siberian Platform. *Yakutsk, Yakutsk Affiliate of SB RAS Publishing House*, 159 p.
- Kontorovich A.E., Savitskiy V.E. (1970) On the paleogeography of the Siberian Platform in the Early and Middle Cambrian, in: *Problems of lithology and paleogeography of Siberia. Trudy SNIIGG&MS, issue 106, Novosibirsk*, 95-108.
- Kontorovich A.E., Bakhturov S.F., Basharin A.K., et al. (1999) Heterochronous centers of naphthide generation and accumulation in the North Asian craton. *Russian Geology and Geophysics*, **40**, 1676-1693.
- Kontorovich A.E., Parfenova T.M. and Ivanova E.N. (2005a) Aromatic biomarker hydrocarbons and dibenzothiophenes in bitumens of the Kuonamka Formation (northeastern of the Siberian Platform). *Doklady Akademii Nauk*, **402**, 804-806.
- Kontorovich A.E., Kashirtsev V.A., Melenevskiy V.N. and Timoshina I.D. (2005b) Composition of biomarker hydrocarbons in genetic oil families of the Precambrian and Cambrian of the Siberian Platform. *Doklady RAS*, **402**, 651-655.
- Parfenova T.M., Bakhturov S.F., and Shabanov Yu.A. (2004) Organic geochemistry of oil-producing rocks of the Cambrian Kuonamka Formation (eastern Siberian Platform). *Russian Geology and Geophysics*, **45**, 911-923.