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BIOMARKER GEOCHEMISTRY OF OIL SEEPS FROM THE BOTTOM OF BAIKAL LAKE

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Offshore crude oil seeps near the east bank of Baikal lake have been known to the local population for ages. The history of studies of Baikal crude oils has been detailed by Kontorovich et al. (1989). Genesis of the oils and gases are related to the mantle, Precambrian or Meso- , Cenozoic source rocks.

In the last paper, we reported the results of geochemical study of terpanes from oil samples taken from three different sites on Baikal lake (Kashirtsev et al., 2006). In cooperation with the workers from the Limnological Institute of Russian Academy of Sciences (Siberian Branch), the earlier unknown oil seeps were collected from the water surface and the bottom sediments in the summer 2006 (10 km off the bank opposite the Gorevoi Utes cape). At this location, oil droplets emerge together with gas bubbles at two places from depths of 860–900 m. where the bottom core samples of the “tar clay” also were taken.

The total-ion-current chromatograms of saturated hydrocarbon fractions differ substantially from these two specimens (Fig. 1). The chromatogram of specimen 1 (from the water surface) allows it to be considered unaltered oil, whereas the n-alkane hydrocarbons in specimen 2 (extract from the “tar clay”) are almost completely absent. Such a picture of the successive disappearance of n-alkanes and the build up of terpanes is characteristic of bacterial oxidation processes. Gas

chromatographic–mass spectrometric studies prove the Baikal oils and “tar clay” to contain the same unique set of the variety of the biomarker molecules. Even TIC chromatograms display the presence of bicyclic sesquiterpanes. Scanning for fragment ions at m/z 123, 179, 193 and 207 has made it possible to identify a large variety of sesquiterpanes of the drimane and homodrimane series. Most investigators believe that compounds having such structures are closely related to higher plant biomarkers. Tricyclic hydrocarbons of the cheilanthane homologous series (*m/z*191) are represented primarily by C_{19} and C_{20} hydrocarbons in insignificant concentrations, a case that is typical of terrigenous oils.

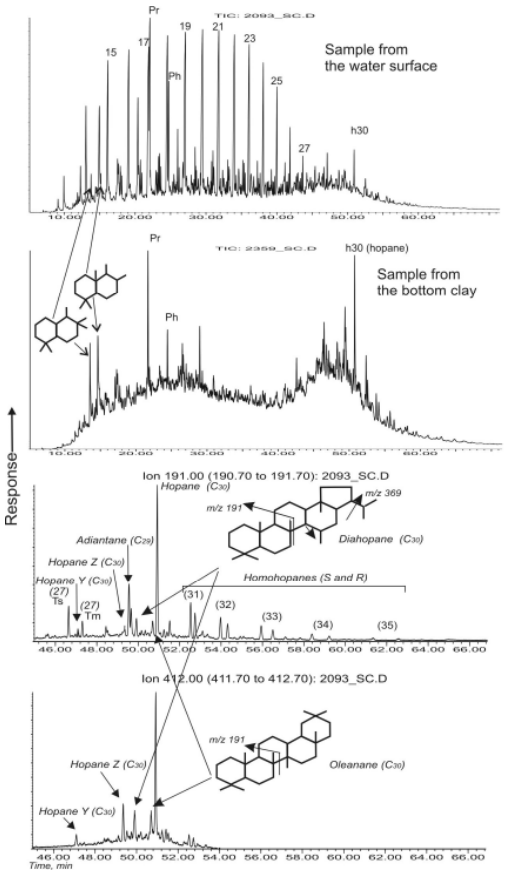

Figure 1. Mass chromatograms (TIC) showing n-alkanes removing from the bottom “tar clay” and mass chromatograms (m/z= 191, 412) showing hopane isomers and oleanane distribution.

Scanning for the fragment ion at *m/z* 191 and the molecular ion at *m/z* 412 showed apart from hopane and moretane , that another four five-ring structures with a number of carbon atoms of C_{30} have been found. One of these entities may be identified as oleonane and other may be attributed to diahopane. We have identified two other hopanes as unknown Y–C_{30} and Z–C_{30}. The former elutes between C_{27}

hopanes (Ts and Tm), and the latter elutes immediately before adiantane.

The presence of oleanane in Baikal oils unambiguously indicates the involvement of remnants of higher angiospermous plants in oil generation and, as a rule, manifests the lacustrine origin of Cretaceous and younger oil-source formations.

The array of data presented above leads to the conclusion that the source of Baikal oils is the organic matter buried in freshwater basin. Along with the remnants of living matter of lacustrine organisms, those of terrestrial higher plants brought from the land played a significant role in this organic matter. The age of source rocks cannot be older than Cretaceous.

REFERENCES

Kontorovich, A.E., Drobot, D.I., and Presnova, R.N., (1989) *Soviet. Geology.*, No. **2,** pp.21-29

Kashirtsev, V.A. ,. Kontorovich, A.E.,. Moskvin, V.I., Danilova, V.P., and Melenevskii, V.N. (2006) Terpanes from Oil Shows of Lake Baikal. *Petroleum Chemistry,* Vol**. 46,** pp. 217–224.