Question of Oil-Gas Occurrence in Marginal Part of West Verkhoyansk Region

G. N. Gordadze, V. F. Mazanov, I. P. Solomatina, Ye. A. Belova

(Geologiya Nefti i Gaza, no. 2, p. 27–30, 1994)

The possibility for hydrocarbon accumulations in the Cis-Verkhoyansk downwarp is indicated by several indirect factors, in particular by the presence of thick deposits of Carboniferous-Permian and Triassic-Jurassic age. Within these deposits are pelitic members enriched in sapropelic and humic organic matter. Alternation in the section of clay seals and reservoir horizons have created conditions favorable for the localization of oil and gas.

The absence of any discoveries in this region is attributed largely to the low degree of geological and geochemical study and the small volume of drilling and geophysical surveys.

The region in which the samples for the present study were collected is located in the central part of the Verkhoyansk anticlinorium in the upper reaches of the Dzhardzhan, Unguokhtak, and Uel'-Siktyakh Rivers, where Carboniferous rocks of the core of the anticlinorium crop out at the surface.

Thirty-three samples of black shales of Carboniferous-Early Permian age were collected from outcrops on the west flank of the north part of the Orulgan Range. This region is in the zone of intersection of the Unguokhtak (northwest) and Central Verkhoyansk (north-south) regional faults and is on the west side of the Verkhne-Dzhardzhan high.

Although long discussed, it is now generally accepted that the junction of the Siberian craton with the Verkhoyansk fold region is along an overthrust zone. See figure 1. The Verkhoyansk fold region was thrust onto the Verkhoyansk downwarp along a system of gently dipping overthrusts. Angles of inclination of the thrust planes ranges from 0 to 50-70°. Estimated horizontal displacement ranges from 20 to 50 km.

The gravity field in the north part of the Cis-Verkhoyansk downwarp and Verkhoyansk anticlinorium indicates that the boundary between strong positive anomalies (Orulgan type) corresponding with outcrops at the surface of dense rocks of the Verkhoyansk complex and apparently also with a basement uplift and strong negative anomalies corresponding with the outer, most subsided part of the Cis-Verkhoyansk downwarp is 50-80 km east of where this same boundary was drawn by geological survey. Thus, a displacement of the Verkhoyansk fold region toward the Cis-Verkhoyansk downwarp by a distance of up to 100 km is fully probable.

The following analyses were made on the samples:

1. determination of content of organic carbon;
2. luminescent-bitumenological analysis;
3. extraction of bitumoids by chloroform;
4. determination of normal alkanes and isoprenoids of the chloroform bitumoids;
5. thermolysis of de-bitumenilized rock.

Content of organic carbon ranges from 1.21 to 4.34 percent. The mode is 2.3 percent. The luminescent-bitumenological analysis gave low yields of bitumoids, the solutions of which did not luminesce. Using capillary extracts, butyrous and light bitumoids luminesced blue, blue-white-yellow, or yellow blue.

The low bitumen content of these rocks determined by luminescence was confirmed by results of extraction in a Soxhlet apparatus. The amount of chloroform-extract bitumoids is in the 0.02-0.04 percent range. All these bitumoids contain very little tar, and asphaltenes are practically absent.

The distribution of normal alkanes and isoprenoids in bitumoids was studied using the method of capillary gas-liquid