

UDC 552.5:550.832:553.982 (571/16)

LITHOLOGIC AND ELECTROMETRIC CHARACTERISTIC OF PRODUCTIVE LAYERS OF THE GURARINCKIY-SOBOLINNIY DEPOSIT LOW-CHALKY ADJOURNMENTS

T.G. Perevertaylo

Tomsk Polytechnic University
E-mail: ezsovaav@ngf.tomsk.ru

Being based on the field-geophysical researches data, the detailed studying of core material and the lithologic-petrographic analysis the description of low-chalky deposit rock lithologic composition is resulted, the electrometric characteristic of sandy layers is given, laws of their distribution in the area and also change of capacities are specified.

Administratively, the investigated area is located in the Kargasok area of Tomsk district. Tectonically, the Gugarinskiy and Cobolinniyy sites are dated to structures of the third order, respectively to Srednesobolinniyy and Sobolinniyy local uplifts complicating the arch part of the Sobolinniyy swell located in a deflection between the Parabelskiy and Pudinskiy megaswells – in southern part of the Ust-Tymskaya cavity. The Sobolinniyy structure is revealed and partially detailed by seismic-survey works MOV s/p 12/66-67 year.

The complex of field-geophysical researches (standard, induction, radioactive, acoustic logging, caverno-

metry and microsounding) is used for partition and correlation of the studied deposits. With the purpose of rock lithologic structure studying the analysis of the core field description is conducted; on wells 181 and 213 of the Sobolinniyy site (further in the text wells S-181, 213) the core material with revealing of texture-structural features of rocks is studied in details, and on wells 13, 181, 182 of the Gurarinskiy site (further in the text wells G-13, 181, 182) and S-181, 213 the lithologic-petrographic analysis of sandy rocks in sections is conducted. Results of investigation are shown in Figs. 1 and 2. Symbols are presented in Fig. 3.

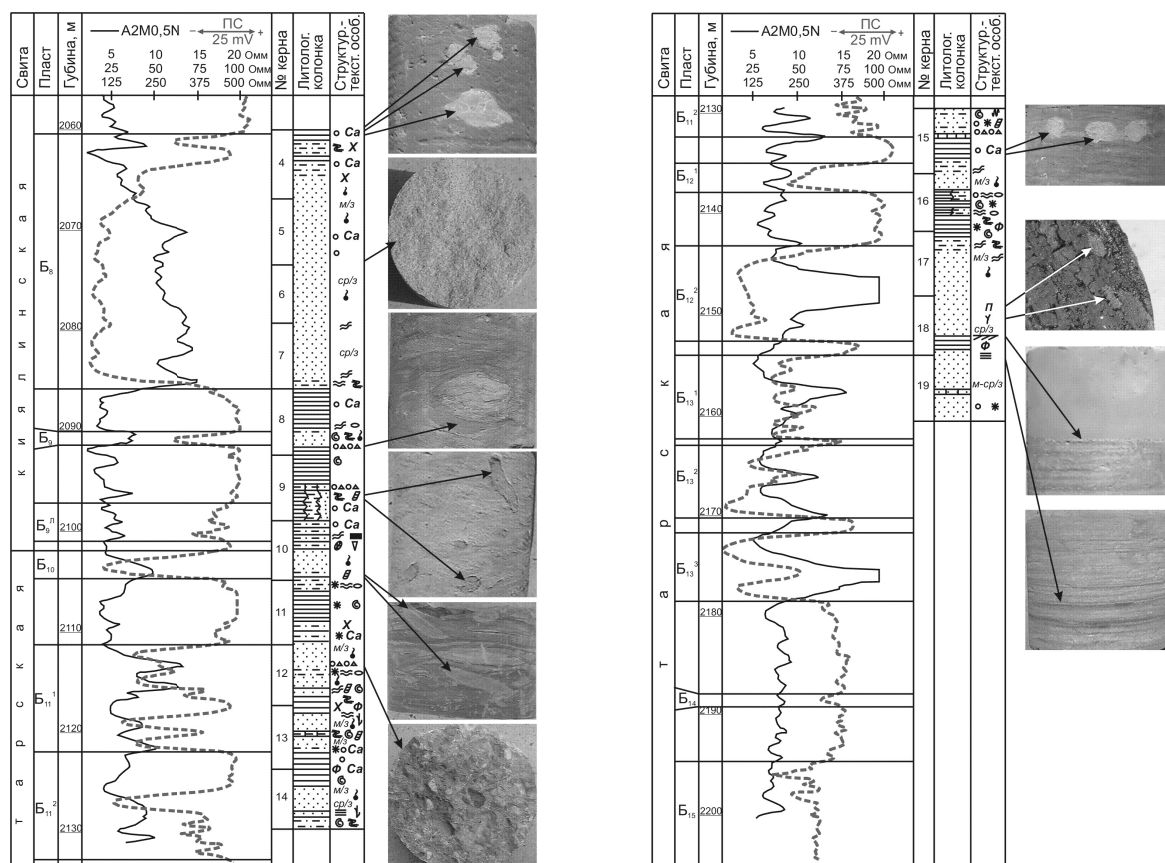


Fig. 1. The lithologic-geophysical characteristic of B₁₅-B₈ layer of the Sobolinnaya 181 well

Explanation to Figures 1 and 2: Свита – Series

Литолог. колонка – Litholog. column

№ Керна – Core number

Глубина, м – Depth, m

Пласт – Layer

Структ. текст. особ. – Structure texture features

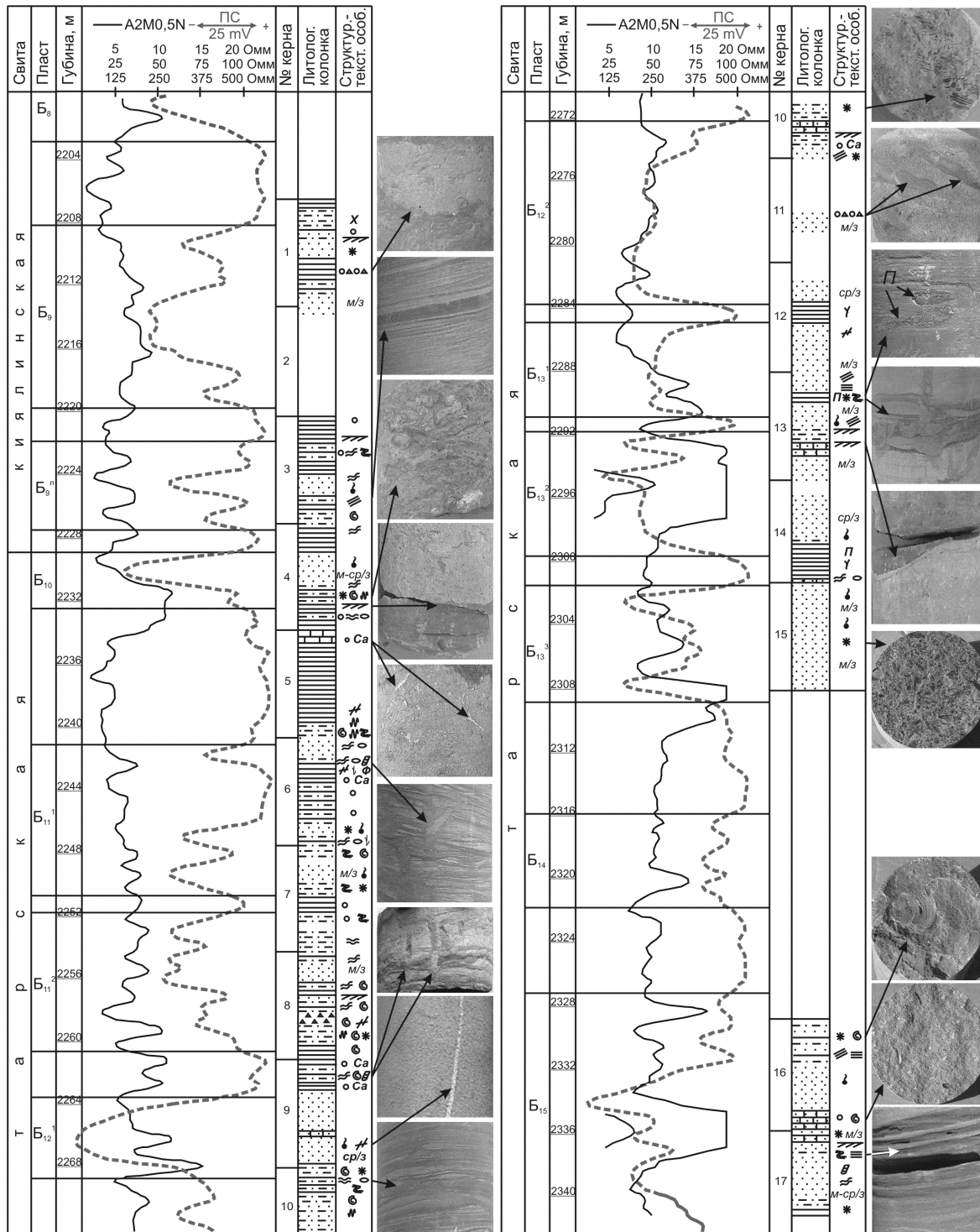


Fig. 2. The lithologic-geophysical characteristic of B₁₅-B₈ stratum of the Sobolinnaya 213 well

Sandy stratum B₁₅ was opened by drilling in 14 wells. Its capacity (*m*) is ranging from 15 up to 35 m. Judging by character of configuration change of spontaneous polarization (SP) curve, and based on the study of core, it has clearly defined «regressive» orientation and is presented by alternation of sandy and aleurite rocks with increase in grain sizes bottom-up in the section. In the bottom part fine-grained light grey layered sandstones prevail with traces of sliding and bioturbational

structures. Lamination is oblique wavy due to alluviums of carbonaceous-argillo-micaceous material. For the top part of the B₁₅ stratum the negative anomaly of SP curve corresponding to high values $\alpha_{sp}=0,6...0,99$ is characteristic. In logging diagrams of all wells carbonaceous interlayers are also differentiated. It proves to be true by the core of well S-213 (see Fig. 2) represented by light grey homogeneous sandstone with calcite cement with abundance of shell and inclusion of vegetative det-

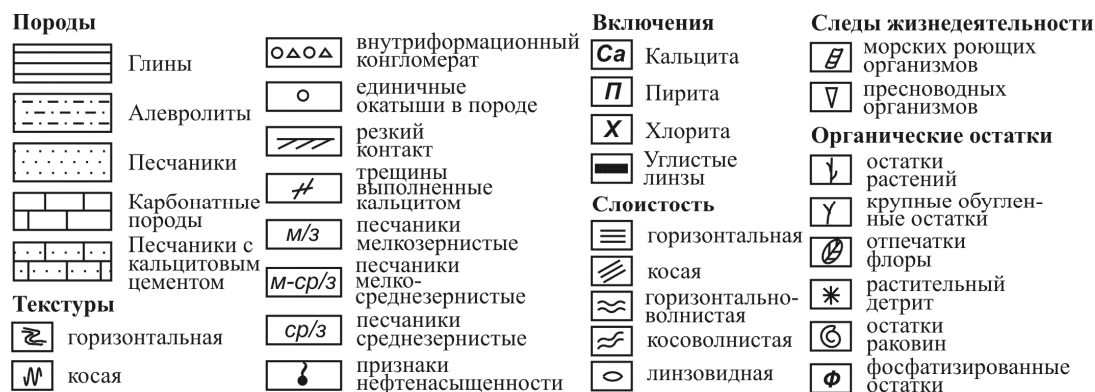


Figure 3. Symbols to figures 1, 2

First column:	Second column:	Explanation to Figure 3:	Third column:	Fourth column:
Rocks	Intraformational conglomerate	Inclusions	Calcite	Traces of vital activity
Clay	Single pellet in rock	Pyrite	Chlorite	Sea digging organisms
Aleurolites	Sharp contact	Carbonaceous lenses		Fresh water organisms
Sandstones	Cracks filled with calcite	Lamination	Horizontal	Organic remains
Carbonaceous rocks	Fine-grained sandstones	Oblique	Horizontal-wavy	Plant remains
Sandstones with calcite cement	Fine-medium-grained sandstones	Horizontal-wavy	Oblique-wavy	
Textures	Medium-grained sandstones	Lenticular		Large charred remains
Horizontal	Indications of oil saturation			Flora imprints
Oblique				Vegetative detritus

ritus. Further, non-uniform oblique- and horizontal-layered interlamination of sandstones, aleurolites and clays with prints of large shells follow. The top border of the layer is fixed clearly enough. Higher rocks are overlapped by clay strata with capacity 5...7 m.

The layer B_{14} is traced through out all the studied area, its m does not exceeded 2 m and characterized by low values $\alpha_{sp}=0,3...0,54$ which corresponds to aleurolites or fine-grained aleurite-like sandstones. Exception is the well G-181 where according to the core description sandstones are presented by fine-grained fraction with alluviums of carbonaceous detritus. Grey, dark grey clays with inclusion of pyrite and charred vegetative organic are deposited higher. Capacity of clay rocks is practically identical to the whole section and makes up 4...7 m.

Layers B_{13} represent strata ($m=14...28$ m) in structure of which 3 sandy layers B_{13}^1 , B_{13}^2 and B_{13}^3 are allocated divided by clay interlayers. The layer B_{13}^3 ($m=6...12$ m) has a regressive construction, the structure of rocks changes bottom up from clay aleurolite up to sandstone with values $\alpha_{nc}=0,5...0,7$ which considerably increase in wells S-181 ($\alpha_{sp}=0,9$) and S-177 ($\alpha_{sp}=0,95$). The most fully the layer is characterized by the core of the well S-213 and represented by light grey, bluish sandstone, at the beginning of the layer aleurite-like, at the end – medium-grained brown petrosated. The strongly-cemented rock is homogeneous, rarely flat-layered due to alluviums of charred vegetative detritus. The layer B_{13}^2 is separated from the underlying by an interlayer of grey homogeneous clays, sections of aleurite-like with rare inclusions of pyrite and large charred vegetative remains. Capacity of a clay pack gradually increases in sub-meridian direction from 1 m (wells G-13, G-181, G-16) up to 4,5 m (area of wells S-171, S-178,

S-179). The layer B_{13}^2 is represented by the core in wells G-13, G-181 and S-213. In the bottom part of the layer medium-grained (the maximal value $\alpha_{sp}=0,79$) mainly homogeneous brown-grey medium- and weakly-cemented with indicators of hydrocarbons (HC) sandstones are deposited gradually transforming above on a section into grey fine-grained strongly-cemented sandstones without attributes of HC. The transgressive cycle of sedimentation is reflected in configuration of SP curve. The overlying grey clays with inclusion of the charred vegetative organic with a sharp contact are overlapped by sandy rocks of the layer B_{13}^2 (S-213, see Fig. 2).

In argillo-aleurite rocks the textures of sedimentation sliding and flowing are stated, and sharp contact to overlying sandstone is also observed. The layer B_{13}^1 has a very non-uniform construction; it is difficult to distinguish the same sections based on configuration of SP curve. Even within the limits of small area of wells G-13, G-18 and G-181 arrangement in the north of the Gurarinskiy site different electrometric characteristics and also sharp change in strata of the layer from 4 up to 10 m are observed. The layer is presented by grey sandstones from fine-grained aleurite-like up to fine-medium-grained fraction (α_{sp} to 0,76) partially oblique-layered due to alluviums of a carbonaceous-clay material and sometimes with HC attributes. In the Sobolinniy site rocks are carbonatized (S-181, S-213). Inclusions of intraformational clay pebble, textures of deposit sliding and flowing are stated, which indicates the washout of underlying deposits. Higher on a section the rocks are represented by clays grey homogeneous seldom layered due to interlayers of aleurolites with rare prints charred vegetative detritus. A sharp contact of the layer B_{12}^2 with sandstone is revealed based on the well S-181 core. Ca-

capacity of the clay pack makes 1...2 m, increasing up to 5,5 m in area of wells G-16, G-19.

Layers B_{12} consist of two parts, are well stated in a section, the deep negative anomaly of SP curve corresponds to them. The layer B_{12}^2 is also difficult to be referred to the certain type in orientation of logging curve change. The layer strata changes over a wide range from 6,6 up to 17,4 m in the Gurarinskiy site and in the Sobolinniy – 7,5...11,2 m. Sandstone with $\alpha_{sp}=0,8...0,99$ from light grey up to brown petrosated, homogeneous strongly-cemented, partially carbonatized with inclusion of large vegetative remains. Layers B_{12}^2 and B_{12}^1 are separated by 3–5 meter strata consisting of interlamination of greenish-grey clays, aleurolites and grey fine-grained aleurite-like sandstones. Lamination is horizontal, wavy, lenticular. Textures of deposit sliding and flowing, inclusion of rounded pebble (intraformational washout) also occur. Rocks with an abundance of shell detritus and charred vegetative organic. Capacity of the layer B_{12}^1 decreases from 5...8 m in the Gurarinskiy site up to 3...4 m in the Sobolinniy. In studied territory it is composed of sandstones medium- and coarse-grained ($\alpha_{sp}=0,78...1$) light grey or brown petrosated, medium-cemented, homogeneous, partially carbonatized. The layer electrometric model in the majority of sections has the form of «triangle» with horizontal pelmatic and inclined straight line, less often serrated or wavy roofing lines.

Layers B_{11} with gross capacity from 13,5 up to 25,6 m, clay intercalation (1,6...5,4 m) are divided into B_{11}^2 and B_{11}^1 , represented by alternation of greenish-grey clays, greenish-grey aleurolites and light grey, bluish-grey and brownish (with HC attributes) sandstones. Layered rocks with traces of washout and sliding are frequently broken with pebble of carbonaceous composition inclusion with an abundance of shells remains in various conditions, vegetative remains with bioturbational textures. Lamination is lenticular, wavy, faltering. Pathes of digging worms and very small burrows of ground animals are observed. Conglomerate-like rocks occur. In general, the intensively indented SP curve is characteristic for layers B_{11} . The layer B_{11}^2 on a greater part of the Sobolinniy site, east and southwest of the Gurarinskiy site has a clearly defined sandstone regressive orientation with α_{nc} in the top part up to 0,72. On greater part of the Gurarinskiy site and in the area wells S-214, S-177, S-179, S-171 location the layer section has a ternary construction where more sanded ones are the bottom and top layers. The layer B_{11}^1 is mainly composed of two intercalation sandstones with capacity from 2...6 m and 1...3 m separated by clay interlayer up to 3 m thick. In general, for layers B_{11} the intensively indented SP curve is characteristic.

The layer B_{10} is distributed throughout the territory. Distinctive features of the layer are: small capacity – 2...5 m and deep negative SP anomaly with α_{sp} from 0,8 up to 1. Exception is made with wells S-178 and S-180 where α_{sp} makes 0,71 and 0,72. The electrometric model of the layer in the majority of wells represents «triangle»

with inclined pelmatic and roofing lines, sometimes complicated by small serration. In the base of the layer lie argillo-aleurite rocks light grey and greenish-grey, with chaotic lumpy textures, with an abundance of remains and prints of different size shells, charred vegetative detritus. There are traces of ground animal vital activity. Brown sandstone petrosated, from fine-medium-grained up to coarse-grained, medium-cemented, homogeneous.

On greater part of the Gurarinskiy site sandstones of the layer B_{10} are blocked by thick strata (up to 10 m), composed of multicoloured brown and green clays. Moving in a submeridian direction, beginning from the well G-28 and practically throughout the territory of the Sobolinniy site (except for wells S-171, s-178, S-183) there is an interlayer represented by alternation of argillo-aleurite greenish-grey layered rocks, brownish-brown clays and greenish-grey aleurite-like sandstones (except for fine-grained sandstones in wells S-175 and S-211 where α_{sp} increases up to 0,59), sometimes with HC attributes. Presence of washout traces and infringement of layers, partially sliding and conglomerate-like textures, pebble of carbonaceous composition inclusion, an abundance of carbonaceous material, plant remains of various conditions, paths of worms are defined. Occurrence in the section of multicolored and green-colored sandy-argillaceous deposits indicates the change of sedimentation conditions (freshened shallow pool). Brown color is caused by congestions of iron hydroxide which was carried over from the continent and deposited near the coastal line [1].

The layer B_9 has a non-uniform construction and unsteady m – from 3 up to 10,5 m. In its structure from 1 up to 4 sandy intercalations of different thickness are present having in most cases shallow negative anomaly with α_{sp} up to 0,6.

The layer B_8 in the Gurarinskiy site is not virtually possible to compare to those in the Sobolinniy. On the territory of the former it is represented by alternating intercalations of sandstones, aleurolites and clays, m of which varies from 1 up to 4 m and the gross thickness of the layer makes 6,0...15,0 m. In the Sobolinniy site m of the layer increases up to 13...23 m due to sanding of the section, especially noticeable in the southern part (wells S-171, S-178 and S-181). Values of α_{sp} make 0,7...1 almost in all wells.

Thus, in distribution of layers B_9 and B_8 the clearly defined regularities are not observed, they sharply differ from underlying layers; have a non-uniform construction, sharp changes of structure and capacity which is characteristic for continental or transitive type of sedimentation. This conclusion proves also to be true by L.J. Trushkova's [2] research which marks that in the field of lagoon and continental deposit development sandy layers are lithologically unstable, differentialed in sections conditionally and not traced even within the limits of separate prospecting areas. Position of their bottom border is usually defined by underlying clay caps and roofs, as a rule, are indistinct and cannot be done unequivocally.

REFERENCES

- Gurova T.I., Kazarinov V.P. Lithology and paleogeography of the Western-Siberian lowland in connection with oil-gas bearing ability. – Moscow: Gostoptechizdat, 1962. – 370 p.

- Trushkova L.Ja. Basic regularities of productive layers and caps distribution in Neocomian of the Ob-Irtishskoe interfluvium // Lithology and Paleogeography Questions of Siberia: Works of SNIIG-GandMS. – 1970. – Issue 106. – P. 4–12.

Received on 01.11.2006