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LITHOLOGIC-PETROGRAPHIC FEATURES AND CONDITIONS OF REGIONAL CYCLITIS J_{15} ROCK FORMATION, REVEALED BY PARAMETRICAL WELL 1st OF WESTERN-TOMSK AREA

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The implemented lithologic-petrographic researches have shown that formation of regional cyclitis U_{15} rocks, revealed by the parametrical well 1 of the Western-Tymsk area (Tomsk region), occurred during two alternating transgressive cycles, features of which are reflected in lithological structure of lower and upper zonal cyclitis. Inclusions of glauconite and chlorite, organic fossils, faunae, various stratification, washout and redeposition traces of underlaying sediments indicates the formation of the studied strata in shallow marine basin with an active hydrodynamic mode.

The detailed lythologic-focal analysis of the core selected in the parametrical well 1 of the Western-Tymsk area, has been conducted with the purpose of an establishment of construction peculiarities and formation conditions of the Jurassic and Cretaceous deposits, not enough studied in the northwest part of the Tomsk region.

Regional cyclitis J_{15} (the Aalenskiy stage) has been revealed in the interval of depths of 3141...3072 m. In its basis lie conglomerates (fig. 1) and the gravel-sandstones containing polycomponental pebble and gravel, consisting of quartz, effusives, siliceous rocks, clay slates, etc. The psephitic material is well rounded, and focused in layers. Cementation of pebble and gravel has been carried out by the sandy matrix which is implementing a role of basal cement. Such conglomerates called basal (extraformational), they begin a new cycle of precipitation accumulation.

In primary cyclitis volume homogeneous medium-grained sandstones prevail. Thin faltering and threadlike lamination is periodically marked: horizontal, flatly-waived, poorly inclined, sometimes wedge-shaped caused by an alluvium of carbon detritus and micas on planes of stratification. Sometimes low-power (few sm) prolayers of clay-siltstone structure appear. Layered character of deposits is emphasized by identical level-by-level orientation of flat informational pebble siderite and clay rocks (fig. 2).

Unlike basal of pebble conglomerates lying in the cyclitis basis, the pebble of intraformational conglomerates has been presented poorly by rounded fragments of the dim sedimentary strata. Such conglomerates occur in the cyclitis basis, both regional and finer character – zonal and local. As a rule, slanting types of stratification are connected with the same streaks.

Sandstones have large charred vegetative rests, fragments of wood, inclusion of coal material, prints of stalks and large leaves of plants. More often they are dated to interbed with intraformational washout.

In the cyclitis upper part the infringement of stratification has been noted: microdumps, sliding, laminas contortion, dim lenses of aleurolites. In fig. 3, microshifts in the sample of the core presented by grey aleurolite with clay light-grey layers are clearly visible.

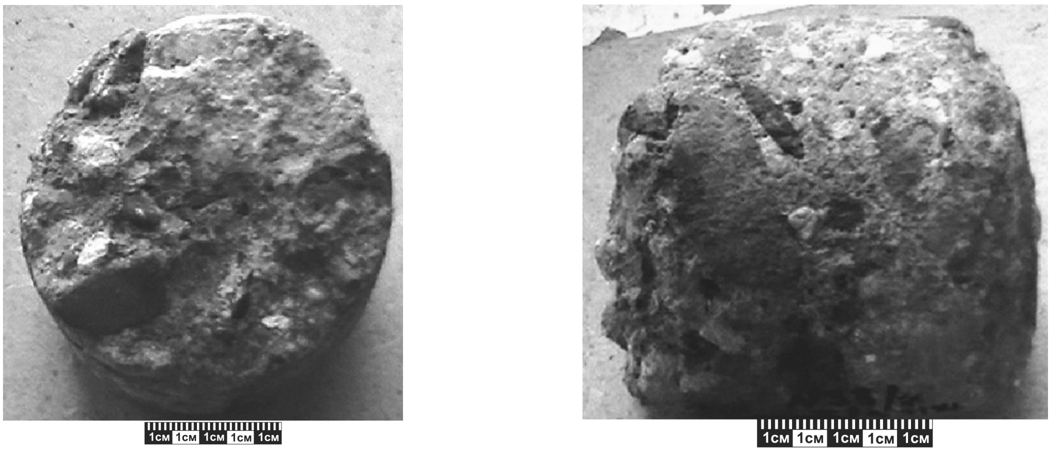

Fig. 1. *Basal conglomerate, main Core, depth 3141 m*

Fig. 2. *Obliquely laminated sandstone with level-by-level pebble inclusions of clay rocks. The core, depth. 3113*

Based on conditions of deposits formation, it is possible to divide regional cyclitis J_{15} into two zonal cyclitis: lower J_{15} – an interval of 3141...3113 m and upper J_{15B} – an interval of 3113...3072 m. Principles of cyclitis allocation, conducted by J.N. Karogodina's [1] methods, have been stated in detail in our previous researches [2].

Bottom zonecyclitis J_{15N} is presented by coarse-grained sandstones with slanting stratification due to alluviums of coal material, homogeneous medium-grained, passing in the top part of zonecyclitis to the fine-grained. In the middle of this strata based on logging two interbeds of sandstones with calcitic cement are allocated. On the background of the homogeneous structures prevailing in cyclitis sandstones, the attributes of not clearly expressed stratification are observed.

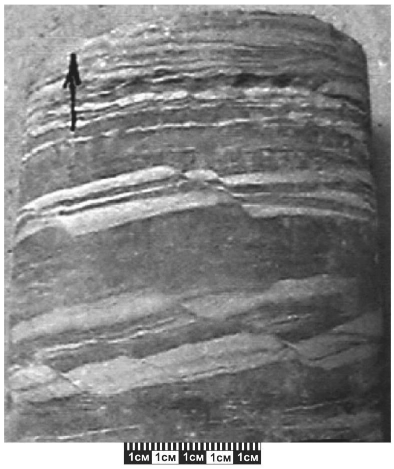

Fig. 3. *Shift deformation of laminas in clay-siltstone interstratification. The core, depth 3066 m*

Upper zonecyclitis J_{15} begins with medium-grained sandstones with inclusions of intraformational pebble (see fig. 2) clay and coal-clay rocks, coal, fragments of sideritized and charred wood, the large vegetative rests, siderite, with sections of washed out and redepositioned clay rocks. Sandstones contain onterbeds (0,3 m) of clay-siltstone and clay rocks with lens, skewed-wavy, wavy and horizontal stratification. Traces of stir up and sliding are marked in the core. Upwards on a cut they are replaced by sandstones with inter-beds of clay-siltstone rocks, carrying traces of washout in the form of layers infringement and rough dim contacts. The stratification skewed- and flat-waived, shallow-lens, wavy-lens, horizontal, sometimes without bedding thin-elutriated clay rocks with mirrors of sliding are marked.

With the purpose of studying sandstone and cementing material structure, sizes of fragments and pores, we had carried-out microscopic analysis on 5 microsections, two of them have been made from the samples preliminary impregnated by painted resin under pressure (marked by the sign *). Microsections have been distributed according the cut as follows: 1 and 2* are dated to bottom zonecyclitis, 3, 4* and 5 – to upper.

According *to granulometric analysis* data the sizes of grains decrease bottom-up: median diameters (Md) change from 0,32 up to 0,17 mm (fig. 4).

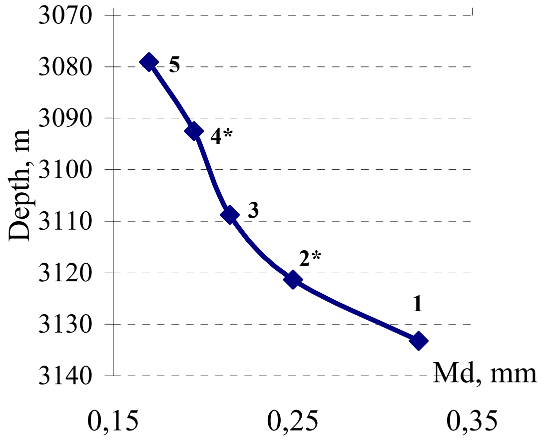

Fig. 4. *Change of grain's median diameter (in microsections) according to cyclitis J_{15} cut*

Fig. 5 illustrates well the prevalence of medium-grained fractions in microsections 1 and 2* and gradual shift of granulometric spectrum towards fine-grained fractions in microsections 3, 4* and 5. Coefficient values of gradation (So) vary from 2,1 up to 1,51 units, decreasing upwards on a cut.

According to mineralogical structure, quartz prevails in all microsections (37...48 %), significant content is possessed by fragments of rocks (25...31 %), feldspars make 20...27 %.

Quartz is presented by transparent colorless grains with direct starvation. Single grains have secondary fissuring in the form of microcracks system (fig. 6). Some grains of quartz are reclaimed, at the same time neoplasms sometimes acquire crystallographic form.

Feldspars, usually, are intensively changed by secondary processes: sericitized, covered by thin coating of iron hydroxide. Feldspars often change into micaceous and clayey fragments, keeping well expressed rectangular form (fig. 7).

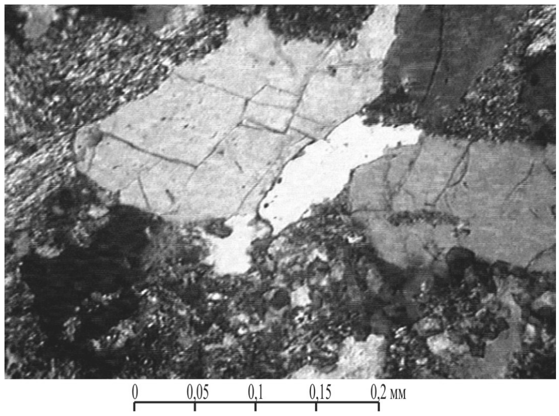

Fig. 6. *Grains of fissured quartz. The microsection, 2 nic., depth 3131,3 m*

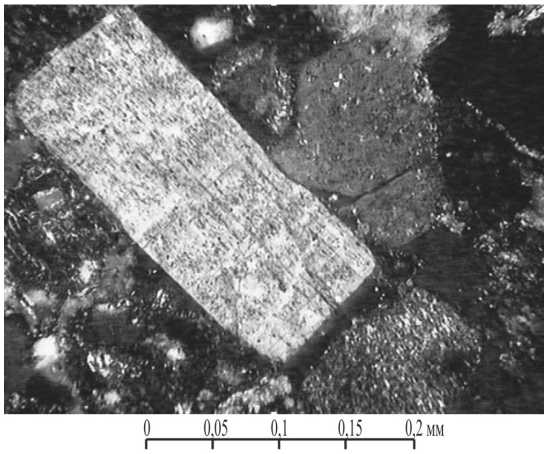

Fig. 7. *Grains of feldspars changed in a different degree. The microsection, 2 nic., depth 3125.0 m*

Among *fragments of rocks* prevail silicious, silicious-micaceous rocks and weak crystallized sour effusives, micaceous and clay fragments are noted, granitoids in the form of perthite joints and pegmatites also occur.

In all microsections the grains of «green» minerals, *chlorite* and *glauconite,* are present**.** Grains of the latter have round form (fig. 8), bright-green color, green co-

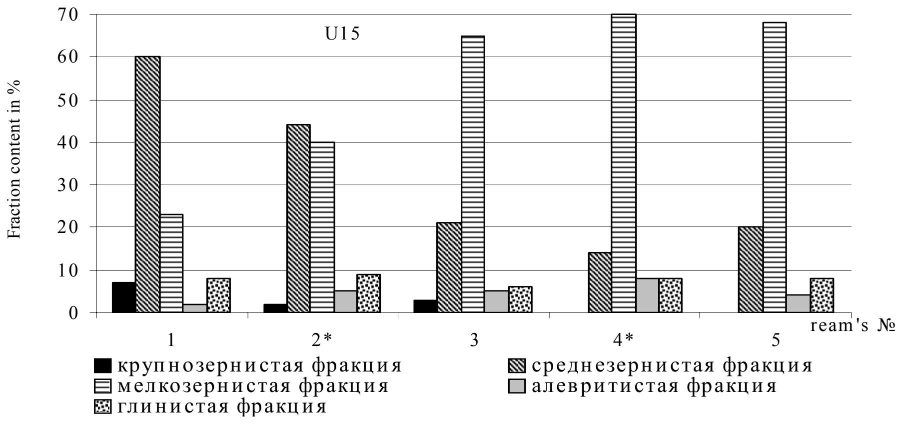

Fig. 5. *Fraction content in cyclitis J_{15} microsections*
Left column (top to bottom) 1) Large-grained fraction 2) Fine-grained fraction 3) Clay fraction
Right column (top to bottom) 1) Midium-grained fraction 2) Siltstonic fraction

lors of interference and micromodular structure. Chlorite comes across in the form of tablets in izometrical forms, often weak pleochroises in green tones, and colors of interference vary from almost violet up to green.

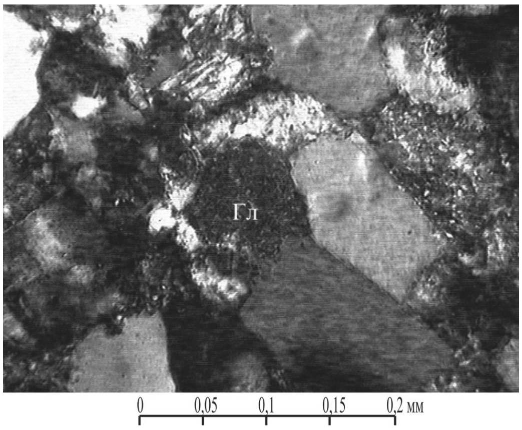

Fig. 8. *Glauconite (Gl). Contact cementation of fragments. The microsection, 2 nic., depth 3074,1 m*

In 2* microsections the fragment (0,8×1,2 mm), consisting of merged round formations of siliceous structure inlaid by pelitomorphic carbonate of calcium (fig. 9) occurs. It is supposed that these are recrystallized silicified remains of the blue-green seaweed spherical colony, in section of which radially located channels [3] are visible.

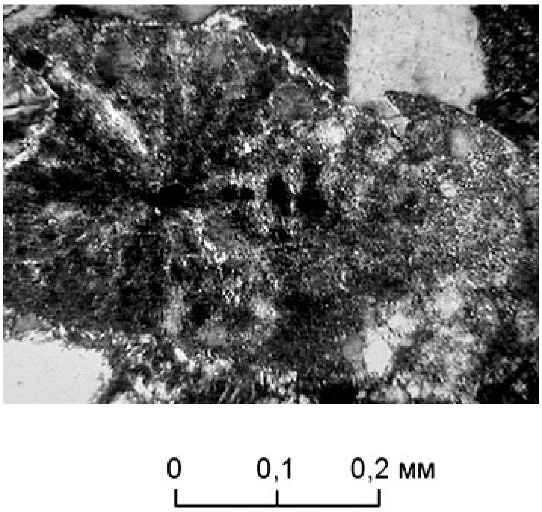

Fig. 9. *Remains of the blue-green seaweed. The microsection, depth 3125,0 m*

The content *of cement* in sandstones makes up 9...13 %. The polymictic structure, non-uneven distribution of minerals and units have caused mixed (film-pore-basal) type of fragments cementation.

Films around grains form hydromicas and siderite, and pore space between fragments is executed by chlorite, micaceous units and siderite. The latter has, in general, microgranular structure. The largest pores are filled with crystal structured secondary kaolinite.

In separate sections grains incorporate among themselves due to the linear and concave contacts, which arise at rocks consolidation (see fig. 8) and grains regenerations. Coefficients value of density and packing increase bottom-up on a cut, i.e. inverse relationship of these parameters with the sizes of grains has been observed.

The free hollow space in microsections is presented by various on the size and the form pores: sinuous intergrain and rectilinear narrow intragrain, and also micropores in cement kaolinite. It is necessary to note that calculation of hollow space in «uncolored» microsections is complicated, due to the small sizes of pores. Nevertheless, the calculated values of porosity as a whole correspond to analytical. Permeability in rocks is low, the maximal value $2{,}8\cdot10^{-3}$ mkm^2 has been measured in the sample from which the 4* microsection had been made.

Thus, sandstones of cyclitis U_{15} have average-fine-grained structure; polymictic composition of the rock-forming part; inclusions of glauconite and chlorite; film-pore-basal type of cementation; a small content of cement (no more than 13 %) mainly of hydromica-sideritic structure; intergrain and intragrain porosity, in the most permeable differences the additional porosity in cement kaolinite. Sandstones relate to collectors of V class.

Conclusions

Carried out researches have shown, that deposits accumulation during cyclitis J_{15} formation took place in two stages which are reflected in peculiarities of lithologic structure of the lower and upper zonal cyclitis. In the basis of zonecyclitis the conglomerates – basal in lower and intraformational in upper are deposited. The sandstones lay onto conglomerates, characterized by the reduction of grains sizes upwards on a cut, and in cyclits bed clays are deposited.

Krocks, generated as a result of display of two alternating transgressive cycles in shallow-marine basin, contain lenses and layers of coal, prints of large fragments of flora and vegetative detritus, nodules of siderite, reputed remains of blue-green seaweed, inclusion of glauconite andchlorite. Traces of washout of underlaying rocks in the form of rounded and non-rounded fragments of clay material and siderite, textures of creeping and separation of laminas, various stratification is the evidence of the studied deposit sedimentation in conditions of high dynamics of waters in the beginning of cycles and its recession by the end.

Sea genesis of one-aged deposits has been established in wells of the Tolparovskaya area earlier by L.O. Egorova and G.I. Tishchenko [4, 5].

Periodically, sedimentary strata came out from under sea level in the form of islands or shallows. Islands became covered by vegetation, then again they have been washed away, enriching deposits by coal material. A lot of iron colloids came through from trail areas in the form of meals which, incorporating to products of vegetative organic transformation in poorly regenerative conditions at the bottom of the basin, have caused an abundance of siderite in rocks.

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PREDICTION OF DEPOSIT OIL-BEARING CAPACITY OF THE TUTLEYM SERIES WITHIN THE KRASNOLENINSK ARC (WESTERN SIBERIA)

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The paper is devoted to the problem of mapping fractured and cavernous fractured reservoirs of the tutleym series within the Krasnoleninsk arc. It is shown that the most perspective deposits are those of the low-tytleym arc. The presence of relation between reservoir and acoustic properties of the rocks involved is stated. For reservoirs to be mapped the results of dynamic inversion of time sections are used.

Considered deposits have been allocated in a rank of the Deminskaya series by P.F. Lee in 1956, which later, in schemes of division into districts of Western Siberia, accepted at meeting in 1960 [1], has been renamed to Tytleym. Three types of a cut are allocated based on content degree of an organic substance in the given formations: Chuelsk, Krasnoleninsk and Tobolsk, each one of them is located in corresponding area [2]. Rocks have been formed in late Jurassic (Low-Tytleym subseries) and early Cretaceous (Upper-Tytleym subseries) times. The general capacity of the given deposits changes within the limits from 20 up to 40 m. Materials of lithologic and geochemical researches of the given deposits have underlied in the basis of some monographies, reviews and articles [3, 4, etc.], according to which the productive layers have been allocated in deposits, presented by siliceous and carbonate lithotypes, where secondary reservoirs are formed, fig. 1.

Oil-gas bearing ability within the limits of the Krasnoleninsk arc (Krasnoleninsk type of a cut) is proved on the Em-Egovskaya, Kamennaya, Lorbinskaya, Sosnovo-Mysskaya, Palyanovskaya areas. Oil debits change within the limits from 0,5...3 up to 100 t/day and more, that is caused by reservoirs non-uniform structure of fractured and fractured-cavernous types.

The upper fluidosupport is represented by, widespread on the Krasnoleninsk arc territory, clay deposits of the Frolovskaya series. Occurrence of oil deposits in considered deposits, first of all, is possible under condition of isolation from permeable differences in underlaying rocks of the Abalakskaya series and formations of the pre-Jurassic complex. Apparently, the variant of hydrodinamically connected deposits is also possible.

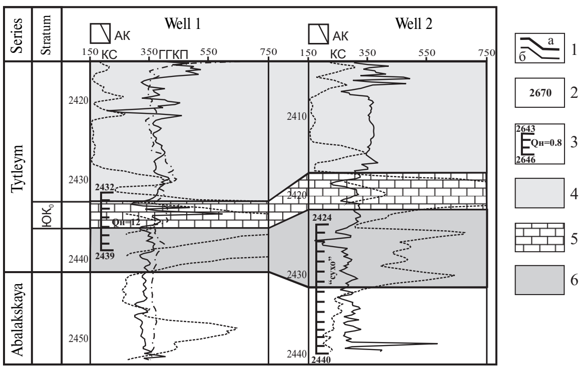

Fig. 1. *Lithologo-geophysical cuts of the Tytleym series: 1) series borders (a), layers (b); 2) cable depth, m; 3) an interval of approbation and test results in the punched stem: $Q_н$ – oil debit, m^3/day; deposits: 4) clay-siliceous bituminous, 5) carbonate, 6) kaolinite-clay*

The forecast of reservoirs development in deposits of the Tytleym series has been carried out on the basis of seismology work results and wells data.

High-speed properties of rocks, composing series divisions, have been studied by means of acoustic logging.

Layer speeds change as follows: the Upper-Tytleym subseries – V_{pl}=2130...2800 m/s (bituminous clay-siliceous formations); the upper part of the Low-Tytleym subseries – ≥4500 m/s (carbonate rocks); the bottom part – 2600...4200 m/s (kaolinite-clay and siliceous rocks).