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Specific Features Of Material Composition Of Jurassic "Sandy" Horizons Of Sudochy Deflection And Their Oil And Gas Potential

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ABSTRACT

The article considers the material composition and mineralogical features of the section of the Jurassic sediments of the Sudochy deflection. The collection properties of sandy horizons were determined and associations of their minerals characterized by correlative features were established, which made it possible to determine the conditions for sedimentation of the studied sediments, as well as the areas and directions of the demolition of debris.

KEYWORDS

Jurassic, formation, deposits, rock, section, horizon, member, area, hydrocarbon.

INTRODUCTION

Macrolithological and petrographic-mineralogical studies of the core of deep wells drilled within the Sudochi deflection show that in the sections of Jurassic sediments, sandy-aleurite and clay rocks of flat-channel, alluvial-lake, delta and marine genesis use a dominant distribution. As a rule, industrial accumulations and manifestations of gas with condensate are associated with precisely these terrigenous deposits, which are

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represented by sandstones, with the exception of the bottoms of the Middle Lower Jurassic deposits, where packs of gravel-pebble sandstones and gravelites with lens-like formations of finely pebble conglomerates appear. The conducted generalization of large actual material on the lithological-petrographic and mineralogical composition of rocks taking into account the features of the geological structure made it possible to distinguish more than 20 regionally aged sand bodies in the section of Jurassic sediments of the studied territory, as well as to trace the area of oil and gas horizons.

MATERIALS AND METHODS

The stratigraphic level of the identified deposits of gas with condensate in the terrigenous Jurassic sediments of the study area corresponds to the lower (Aralyk), middle (Urga, Dali, Aral) and upper (Urga) sections. In total, in the section of the identified deposits, various authors distinguish 6 horizons with proven productivity: Kuanysh (J_1), Muynak ($J_{2\ aa\text{-}bs}$), Aral ($J_{2\ bt}$), Alambek ($J_{2\ kel}$), Akchalak (J_2 ok) and Shakhpakhtinsky ($J_{3\ km\ \text{-}tt}$) [1]. The Kuanysh horizon (J_1) is represented mainly by sandstones of various grains, grey, dark grey, quartz-feldspar with an admixture of micas, with a massive and oblique layered texture, in places with coal interlayers. They are characterized by an abundance of leaf imprints, stem fragments, and fern detritus. According to the research of Z.S. Ibragimov, the density of the Lower Jurassic reservoirs is 2.3-2.4 g/cm^3, the open porosity is 2-10%. The thickness of the Kuanysh horizon varies along sections from 60 to 106 m [2].

The Muynak horizon ($J_{2\ aa\text{-}bs}$) is represented by fine-medium-grained sandstones, grey, light grey with lenses and interlayers of gravestones, siltstones, and clays. The terrigenous material in this is 85-90%, the cementing part is 10-15%, and the fragments are well-sorted and evenly distributed in the rock. Their shape is rounded, semi-rounded, and less often irregular, in places the grains are strongly condensed and tightly touch each other. The composition of the sandstone cement is clayey, calcite and clay-mica. Clay substance - fine-flaked, mostly kaolinite, fills in individual pores and the space between debris grains or protrudes into them. The structure of sandstones is psammitic, occasionally aleuropsammitic.

The Aral horizon ($J_{2\ bt}$), lies at the base of the Bathonian stage and is represented by massive, cross-bedded, uneven-grained sandstones, often with the inclusion of rock fragments of gravel size. The structure is psammitic, psammitic-psephitic, aleuropsammitic, the texture is massive, weakly layered. Under the microscopic definition, it was found that the rock consists of a rather densely packed, differently sorted clastic material (70-95%), cemented with mica-clay, clay-carbonate and lime cement (5-30%).

The type of cementation is quite diverse - basal, pore, pore-basal. The grain sizes are 0.1-0.5-1.0 mm, while the sizes of 0.25-0.4 mm prevail. Clastic material (grain size 0.1-0.5-1.0 mm) is represented by quartz (20-50%), feldspars (10-20%), rock fragments (30-70%), micas (1-2 %), single grains of radiant chalcedony, zircon, apatite, rutile needles. Fragments of rocks are diverse in composition; they are dominated by quartz, siliceous, mica-clayey, mica varieties of the acidic and intermediate composition of effusive rocks. The cement of a mixed type, in composition formed by the decomposition products of terrigenous mass (especially micas), fills the pore and intergranular spaces.

Organic matter - 15-20 %, brown, yellow-brownish tint, in the form of films, permeates the entire rock and envelops debris grains.

The Alambek horizon ($J_{2\ kel}$) is represented by gravel-pebble sandstones (the base contains conglomerates) with carbonaceous inclusions, fine oblique bedding (photo 1). Polymictic sandstones with abundant (30-40%) clay, clay-chlorite cement, basal, porous and corrosive types. Among the terrigenous material, feldspars (15-25%), quartz (25%), micas (1-5%) are widely developed; single grains are represented by zircon, leucoxene, sphene, tourmaline, rutile, epidote, anatase, etc.

Figure 1. Gray, light grey sandstone with numerous inclusions of plant detritus, North Berdakh deposit, borehole no. 10, int. 2340-2346 m.

Under a microscope, quartz grains look clean, transparent, sometimes they contain rare inclusions of dusty matter. The shape of the grains is generally angular, sometimes semi-rounded or acute-angled. Quartz grains with small grooves are found, typical of fragments of quartz crystals from effusive rocks. Feldspars are represented by plagioclase and microcline. Individual grains are almost completely transformed into an aggregate of fine-flaked sericite. Microcline grains are fresh with a distinct microcline lattice. The fragments have a round, oval, or irregular shape, their contours are often indistinct, as if dishevelled, sometimes difficult to distinguish from the cement substance. The size of rock fragments ranges from 0.2 to 1.5 mm and more. Sandstone data on pl. Shege, Shagyrlyk, Vostochny Muynak, Arman, Vostochny Berdakh-10 are characterized as class I-II collectors [3].

The Akchalak horizon ($J_{2\ ok}$) is composed of interbedded sandstones (more), siltstones and silty clays. Sandstones are light green, greyish-green, dense, firm, fine-grained, plant leaf imprints are noted (Fig. 2.). Microscopically - polymictic sandstones with clay cement. Clastic material - 80-85%, porous-film type cement - 15-20%. Clastic material - unsorted, semi-rounded, angular. The grain size is 0.5-0.4 mm. Silty impurity is often 10%. Composition: quartz 35%; feldspar - 35%; fragments of rocks - 20%; mica + chlorite - 10%.

Accessory elements - zircon, tourmaline. Fragments of rocks - siliceous, micaceous, quartz, fine aggregate, intensely chloridized.

Carbonate material - 2-6%, represented by fine-medium-grained calcite with an isomorphic admixture of dolomite, replaces detrital grains and single tabular grains, is located in pore spaces. The composition of the cement is clayey (hydromica), porous-film.

Sandstones of the Akchalak horizon of the Oxfordian stage are characterized by the presence of a small amount of cement and a weak degree of manifestation of secondary changes related to the diagenetic stage of lithogenesis.

The Shakhpakhtinsky horizon (J_3 km-tt) is lithologically heterogeneous, in the western half of the Sudoch Trough and the central part of the Kuanysh - plant leaf imprints, deposit. Surgil, well 21. int. 2132 - 2140 m.

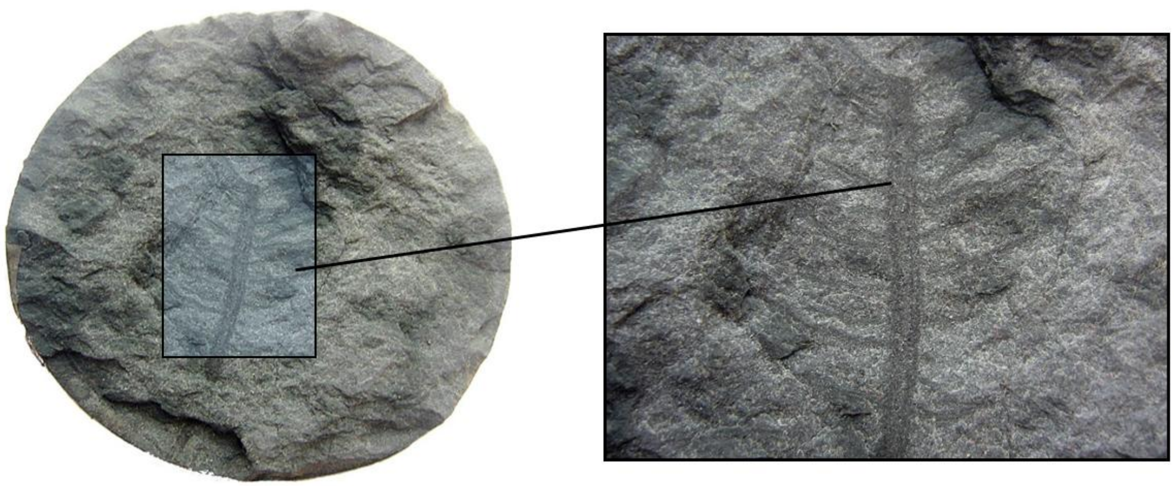

Figure 2. Песчаник алевритистый, с зеленоватым оттенком, встречаются отпечатки

Koskalinsky shaft. It is carbonate, of marine genesis, and on the periphery - sandy, sandy-silty, bar or delta genesis. In terms of petrographic composition, the carbonates of this horizon belong to the organogenic or organogenic-detrital genetic group and consist of mineralized skeletal remains of bryozoans, oncoliths, blue-green algae, fragments of sea urchins, crinoids, oysters, gastropods, and foraminiferal shells. Microscopically, limestones are represented by fine-grained varieties, consisting of crystalline calcite and impurities of terrigenous and clayey materials. Calcite grains 0.5 mm, fractured in places.

CONCLUSION

As a result of studying the material composition and structural and textural features using grain size analysis, it was found that the Jurassic deposits of the Sudoch Trough are mainly represented by terrigenous deposits, which include conglomerates, gravestones, sandstones, siltstones and mudstones (clays), as well as mixed and intermediate differences. At the same time, carbonate rocks are distributed only in the section of the Kimmeridgian-Tithonian stage. It should be noted that the geological section of the Lower Jurassic (Plinsbach-Toarcian deposits) of the study area is characterized by significant fluctuations in thickness due to the erosion of pre-Jurassic deposits. They are

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mainly represented by sandstones with subordinate interlayers of dark grey, black mudstones and siltstones with characteristic interlayers of gravestones. The rocks contain a large amount of coalified scraps of tissue and organic matter (bitumen type) of brown-black colour, confined to sandy gravelstones. As a result of the study of the mineralogical composition of rocks, associations of allogenic, authigenic and accessory minerals characteristic of the Jurassic strata have been established, characterized by correlative features that make it possible to determine the conditions of sedimentation of the studied deposits, as well as the areas and directions of removal of clastic material. Genetic interpretation of the granulometric analysis data made it possible to reveal the features of sedimentation of rocks of each stage. The obtained results correlate well with the data of complex lithological-petrographic and mineralogical analyses when specifying the reservoir properties of the studied rocks.

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