

UPPER PALEOZOIC SEDIMENTARY FORMATIONS OF THE FERGANA DEPRESSION AND PROSPECTS OF THEIR OIL AND GAS POTENTIAL

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ABSTRACT

This article is devoted to the study of the deep geological structure of the Fergana depression and the relationship of the structural plans of deep-lying horizons, the patterns of their fault-block structure, rhythmic stratigraphy, paleogeographic and formational analysis and oil and gas potential of the Upper Paleozoic deposits.

Keywords: *Fergana, Paleozoic, biostratigraphy, tectonics, organogenic structures, hydrocarbons, carbon, perm.*

INTRODUCTION

Study area

The article discusses the Fergana intermountain depression (Uzbekistan). The object of research is the areas of development of sedimentary formations of the Upper Paleozoic of closed territories of the Fergana depression and Karachaty mountain in South Fergana (Khusanov A.S. 2018).

MATERIALS AND METHODS

Research method

The geological materials of sediments of the Upper Paleozoic of the Fergana Basin are considered. Research methods consist in a thorough analysis of exploratory, exploration and parametric wells, seismic exploration, as well as information from the entire complex of sedimentary formations of the Upper Paleozoic of the Fergana depression of previous studies covered in stock and published works of a number of geological scientists. Used traditional and modern research methods.

RESULTS AND DISCUSSIONS

Results of Application of Estimation Method

The obtained results are substantiated by geological, biostratigraphic, paleogeographic and geophysical studies of sedimentary strata of the Upper Paleozoic of the Fergana depression in outcrops and cores of wells. The results of analytical studies are based on analyzes of leading laboratories of the Republic of Uzbekistan. The article is based on factual material collected by the author personally when performing a number of fundamental, applied, innovative and contract-based research projects using the results of previous researchers. The conclusions are consistent with the basic concepts of paleogeography, lithofacies, and biostratigraphic studies and do not contradict the existing concepts (Khusanov *et al.*, 2013).

Conclusion

- Basic information was obtained on the conditions of sedimentation of the studied strata, climate and paleogeography, based on the presence of numerous textures and organic residues in the Fergana depression.
- It has been established that a wide range of sedimentation conditions of strata created favorable prerequisites for the formation of manifestations of minerals, primarily oil and gas deposits, in them.
- Identified promising areas for the formulation of work, in order to identify hydrocarbon deposits in the sediments of the Upper Paleozoic, with high reservoir properties.

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- The study of the Upper Paleozoic formations of the Fergana Basin allows you to put forward as the lower oil and gas bearing floor.

Oil and gas formations are established in different regions in the platform, geosynclinal provinces and transitional provinces: sandy-clay and carbonate (for ancient platforms), sandy-clay coal-bearing coal, sandy-clayey glauconite, less commonly carbonate and carbonate-terrigenous (for young platforms), carbonate, terrigenous-carbonate (for geosynclinal and transition regions).

Significant completeness of the section of the Upper Paleozoic of many regions of the Southern Tien Shan, their saturation with organic remains of various marine organisms, the availability of relief for detailed work. These circumstances attracted the attention of many biostratigraphs (Miklukho-Maklai, 1963; Bensch, 1982; Dzhenchuraeva, 1993). As a result of many years of work with complex lithologic-facies and biostratigraphic studies, Paleozoic deposits were studied in detail and dissected into suites of various sections of the biostratigraphic scale.

The frequent change of transgressions and regressions in the epicontinental basins of the Tien Shan was influenced by both eustatic processes associated with the World Ocean and local tectonical features. Sedimentary accumulation at times experienced a significant effect of active volcanism, which manifested itself in a vast area of Chatkalo-Kurama, which had only a few “carbonate pauses” in the Paleozoic. The warm, humid climate of the Paleozoic, especially in the middle Carboniferous - early Perm, was favored by a well-developed hydro network, which supplied terrigenous materials and an abundance of organic matter to sedimentation basins.

As a result of the humid climate of the late Carboniferous, coal formation was insignificant in scale, but it did not lead to coal accumulation. Its manifestations are known on a series of outcrops of the Late Carboniferous in the mountains of Guzan and Karatau. Probably, the processes of coal accumulation were hindered by the frequent manifestations of local tectonics, which were recorded in numerous intraformational erosion and disagreement.

The late Paleozoic sections of the Guzan and Karatau mountains have lower sediment thickness, but are also represented by a complex combination of marine and delta sediments. In the northern frame of the Fergana depression, terrestrial sediments of the Late Carboniferous and Permian dominate, but in some places they occupy large areas (the Atoynak ridge, etc.) and deposits of submarine deltas. Organogenic constructions are also known here (Rassan in the Naryn river basin). In the Late Permian, a large and last in the Paleozoic regression of the basin to the south, to present-day Darvaz and the Pamirs, took place against the background of increasing climate aridization in the region. This has affected the change in the facies settings of sedimentation, the accumulation of coarse-clastic strata of the red-colored molasse formation, most pronounced in the northern side of the Fergana depression (Bozbutau Mountains, etc.).

The Hercynian orogeny led to the creation of complex structures composed of Paleozoic sedimentary formations, the development of a network of multi-scale disturbances. It is possible that their presence contributed to the circulation of liquid hydrocarbons and the redeposition of deposits. Despite the presence of such large tectonic disturbances as the South Fergana and North Fergana deep faults with significant thickness and length of tens of kilometers in the frame of the Fergana Depression, numerous manifestations and deposits of liquid hydrocarbons, as well as exposed by erosion and oxidized to asphalt deposits.

Detailed characteristics of sedimentary formations of the Upper Paleozoic of the Fergana Basin are provided by the unique nakedness of many of their sections and high saturation with inclusions of various floristic and faunistic remains, as well as a variety of biogenic and mechanogenic textures.

Based on the long-term complex lithological-biostratigraphic works of several generations of researchers, data on the correlation and dismemberment of the Late Paleozoic sedimentary formations of the studied area have been obtained to date.

In South Fergana (Kurgantash, Bosogotash, Chortash, Karachaty) nizhnemoskovsky mid-substage represented upper member kalmakbulakskoy Formation (200-550 m), folded interleaved polymictic sandstones, silts and shale streaks with rare grits, limestone and marl.

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The wide area development and thickness of the sedimentary polyfacial, slightly metamorphosed formations of the Upper Paleozoic of the Fergana depression, among which underwater-delta and marine carbonate sediments, have been significantly developed. It has made it possible to positively evaluate the prospects for their petroleum potential.

High levels of organic matter in the Late Paleozoic formations of the Karachatyr Mountains, which have accumulated in a wide range of facial settings, among which large organogenic structures have been identified (Khusanov *et al.*, 2013), can be considered as potential source materials. In order to clarify the spatial development of organogenic structures experimental geophysical studies were carried out (B.T. Tal-Virsky and others, 1982). At the same time, their continuation was established at a considerable distance to the west.

The peculiarity of the tectonic regime led to the long existence of the epicontinental Fergana sea basin with the development of facies from shallow water to relatively deep-sea local depressions. At several levels of the Karachatyr mountain section, morphologically diverse organogenic structures, from domes to reefs, have been identified and studied. Their thickness is up to the first hundred meters (mountains Tuya-Muyun, Dzhilgin-sai) with a considerable length. The largest organogenic structure of Ak-Bulak was found near the border of the upper carbon and lower Permian in Western Karachatyr (Khusanov *et al.*, 2014).

Submerged productive horizons are fundamentally new geological objects, the study of which has not previously received adequate attention. Information about the Paleozoic structural floor is limited to a shallow opening of Paleozoic formations by a rare network of wells and the intersection of their seismic profiles. The low degree of knowledge of the Paleozoic structural floor is the main reason for the lack of specific objects to accommodate the volume of exploratory and exploratory drilling.

When testing the Paleozoic section of South Fergana, positive results have already been obtained at the wells of Z.Palvantash, South Alamyshik, etc. In the Devonian – Early Carboniferous time, carbonates (dolomites and limestones), often containing inclusions of various marine organisms, were widely developed in sections. The thickness of such sequences is significant and reaches several hundred meters, which is an indicator of calm sedimentation environments.

A detailed study of the data set made it possible to isolate zones within the Fergana Basin by the degree of prospect for oil and gas.

The most accessible in the detection of industrial accumulations of the Paleozoic oil and gas fields are the zones of regional break, located between the South Fergana deep and South Fergana flexure-discontinuous zones. Here, among the Paleozoic sediments, reef-like structures, sand-silt and carbonate sediments are often found, their thickness reaches up to 2-3 km.

These deposits in the Khodjaabad, South Alamushuk, Shursuy, Kim and Rishtan structures lie at a depth of 2-3 km from the surface. Sediments are considered as the most promising for oil and gas. Here can be found arched and lithologically limited deposits.

In the Fergana depression, areas favorable for the accumulation of hydrocarbons and their vertical zonality (Buston, Rishton-Kim, Shursu, etc.) are distinguished.

To assess the oil and gas potential of the studied area, oil source packs and suites, the presence of reservoirs and fluid guards have been determined. They are organogenic limestones (reefs) and sediments of remote zones of paleobasins, represented by rocks of the black shale formation.

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