

ANNOTATION

to dissertation submitted for the Doctor of Philosophy degree (PhD), the specialty "6D070600 - Geology and Exploration of Mineral Deposits"

Kulumbetova Gulmira Erbolatovna

«Geodynamic evolution and oil and gas potential forecast on the eastern edge of the Caspian syncline»

Assessment of the current state of the scientific and technical problem (tasks).

Kazakhstan plays a significant role in the global oil and gas market due to oil production. But, unfortunately, the scope of explorations is decreasing every year. The number of discovered oil deposits in recent decades has fallen sharply compared to the 80s and 90s of the last century.

To maintain the level of production, it is necessary to replenish the hydrocarbon reserve by discovering new fields, but without directed large-scale geological exploration it is impossible to achieve this goal. Therefore, the determination of directions for hydrocarbon deposits explorations is an important and relevant issue for the geological industry.

The Caspian syncline is the largest oil and gas basin in Kazakhstan. It is estimated as the most studied area and has the highest potential of forecast hydrocarbon resources. At the same time, in spite of good exploration state, the Caspian syncline contains great potential for discovery of new deposits of oil and gas.

The main oil and gas deposits, to which the large and large deposits of the east of the Caspian are confined, are the well-studied strata KT-I and KT-II, which are the objects of exploitation in the main oil fields of the east of the Caspian. At the same time, back in the 1980s, the carbonate stratum of CT-III was delineated with a rather high probability. Only 5 wells within the eastern part of the Caspian Sea reached the depth of the KT-III stratum, including the recently drilled well U-5 of the Urikhtau field. During drilling of well U-5, high gas readings were revealed in the intervals of depths of the KT-III stratum. This fact provides strong evidence of the presence of hydrocarbon deposits in deep-seated Devonian sediments.

Other zones of the presalt complex, such as the marginal parts of the carbonate platforms, also belong to promising and incompletely explored zones of the eastern Caspian region. Some features of the geological structure of these zones give reason to assume the presence of deposits in terrigenous sediments, possibly of non-structural type traps, as well as in areas of drift cones.

The postsalt complex, which is also well studied and discovered by drilling many wells, contains areas of potential commercial valuable accumulation of hydrocarbons. To determine such directions, a comprehensive basin modeling of the presalt sediments is required.

Relevance of the research topic

In order to determine specific directions for studying the hydrocarbon potential, a detailed study of the geological and geophysical material is necessary - structural map data, well data, geochemical characteristics of oils, etc.

As part of this dissertation for the eastern edge, studies were carried out to determine the oil and gas prospective zones taking into account the lithological and facies features of sediments, the tectonic environment of the deposits formation period, and the evolutionary processes of geodynamics and how it affected the preservation and development of oil and gas traps and on possible migration ways of hydrocarbons were carefully studied.

Particular attention was paid to the oil and gas potential of the KT-III presalt facility. The calculation of the amount of liquid and gaseous hydrocarbons that are capable to accumulate in the deposits was carried out.

Other perspective oil and gas zones in the presalt and postsalt complexes were also studied.

The object of research is sedimentary deposits on the eastern edge of the PreCaspian syncline.

The purpose of the thesis is a detailed study of changes in the geodynamic situation on the eastern edge of the PreCaspian syncline and its influence on the formation of oil and gas source rocks and favorable conditions for hydrocarbon accumulations and the determination of perspective directions for further explorations.

To achieve this goal it was necessary to solve the following tasks:

1. To analyze wells data and study the lithological and stratigraphic characteristics of the rocks that make up the sedimentary complex, facies distribution, conditions and stages of sedimentation

2. To analyze the tectonic structure of the eastern edge on the basis of new seismic data.

3. To study the geodynamic evolution of the region.

4. Изучить особенности нефтегазоносности разреза и закономерности ее изменения по региону.

5. To study the features of the oil and gas potential of the section and the laws of its change in the region.

The basis and initial data for the development of the topic. When working on the topic of the dissertation, we used stock materials on the deposits of the eastern edge of the PreCaspian syncline – structural maps, core and mud data analysis, results of drilling and testing of wells.

The basis for the development of the topic of the dissertation is the positive results of testing wells that have discovered deep-lying subsalt deposits, as well as various scientific articles and studies aimed at determining the undiscovered hydrocarbon potential of suprasalt deposits of the east.

Practical significance

The establishment of favorable geodynamic and facies conditions for oil and gas formation and oil and gas accumulation with the allocation of specific objects for setting up exploration to detect new deposits in the Devonian and lower Carboniferous deposits.

The implementation of research results -

The work carried out to justify investment attractiveness and scientific justification for the prospects of reef deposits of the Devonian age, deeper than the productive stratum KT-II of the Urikhtau field finds significant practical application and confirmation that in 2020 JSC NC KazMunayGas plans to drill a deep well (5000 m) in this area.

For other perspective areas of the region the recommendations for exploratory drilling are submitted for consideration to interested investors

The scientific novelty of the study is as follows:

- The lithological-stratigraphic complexes perspective for oil and gas were studied in detail, revealing patterns of distribution and changes in their structure within the eastern side of the PreCaspian syncline.

- Schemes of the facies environment and sedimentation stages for presalt and postsalt complexes with the identification of the most favorable areas for oil and gas formation and oil and gas accumulation were developed.

- Considering the tectonic structure of lithological-stratigraphic complexes, the geodynamic evolution of the region, which determines the conditions of sedimentation and the formation of oil and gas deposits, was reconstructed.

- The prospects of the new carbonate stratum KT-III are substantiated. Its resource potential is calculated.

Defended scientific provisions:

1. The geodynamic evolution of the eastern side of the Caspian syncline in the Devonian and Carboniferous was favorable for oil and gas formation and oil and gas accumulation, as well as for the formation of structural type traps and carbonate structures, in the form of reefs of Urikhtau and others, on the slopes of large structural elements.

2. Identify and justify the prospects of the new CT-III facility, calculate its resource potential, calculation of its resource potential, recommend conducting exploratory work and drilling a prospecting well 6000 m deep.

3. Based on the geodynamic evolution, perspective zones of hydrocarbon accumulations in the subsalt and postsalt complexes of the eastern side of the Caspian syncline are identified

Publications and approbation of work

Based on the results of research of the dissertation, 11 articles were published, including 1 in the international journal included in the Scopus database, 4 articles in specialized publications recommended by the Committee for Monitoring in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, 3 articles published in Russian specialized journals, 2 of which are included in the journal, by decision of the Higher Attestation Commission of the Ministry of Education and Science of Russia, in the "List of peer-reviewed scientific publications in which the main scientific results of dissertations for the degree of candidate of science, for the degree of doctor of science" should be published, 3 articles published in collections of international conferences.