Prospects for the oil and gas content of the Maikop deposits of the Yevlakh-Agjabedi trough according to hydrogeological criteria

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Abstract

Based on the analysis and generalization of geological and hydrogeological materials on the Maikop deposits, a schematic map of the oil and gas potential of these deposits in the Yevlakh-Agjabedi trough has been compiled, where highly promising, promising and unpromising zones have been identified. In the northwestern and southeastern directions, as well as in the central part of the trough and its northeastern side, the Maikop formations are hidden under a layer of younger sediments. Sediments of the Maikop series were uncovered by a large number of exploration and structural-search drilling wells within almost all areas of the Yevlakh-Agjabedi trough (Dalmamedly, Kazanbulag, Borsunly, Godakboz, Adzhidere, Sarialdag, Naftalan, Terter, Agdzhabedy, Beylagan, Sovetlyar, Amirarch, Zardob, Muradkhanly and others). The contact of the Maikop series with underlying formations in different areas of the Yevlakh-Agjabedi trough is expressed differently. Here, both a conformable transition from the Upper Eocene to the Maikop series and the transgressive occurrence of the Maikop on various Paleogene and Mesozoic horizons are noted, which is associated with the peculiarities of the geotectonic development of the trough.

Keywords: oil and gas potential, Chokrak deposits, supergene process, hydrocarbon, Akchagyl Sea, highly promising, unpromising.

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1. Introduction

The industrial oil and gas potential of the Maikop deposits of the Yevlakh-Agzhabedin trough has been established in the areas of Kazanbulag, Adzhidere, Naftalan, Terter, Muradkhanly, Zardob. In addition, there are numerous oil and gas shows from these deposits in the areas of Saraaldag, Gedakboz-Duzdag, Shirvanly, Agjabedy, Beylagan, etc.

The Maikop sediments, composed mainly of clays, are distinguished by a high content of CDOM and are one of the main oil and gas-generating strata of the trough. However, due to the absence of regional aquifer (permeable) reservoirs in its section, the accumulation of generated hydrocarbons into large deposits in these sediments is difficult. Therefore, where the proportion of sandy-silt formations increases in the Maykop clay section, the probability of the formation of large oil and gas deposits also increases [1-10].

2. Methodological part

The conducted studies show that at the end of the Maikop time, after the deposition of sediments of the same name at the beginning of the Tarkhan-Chokrak time, the southwestern border of the Miocene sea basin moves to the northeast. An extensive strip of Maikop sediments on the southwestern side of the Yevlakh-Agjabedin trough is exposed and becomes an arena for the development of supergene processes from the beginning of the Tarkhan time until the great Akchagyl transgression, then all the areas of distribution of Maikop sediments are covered by the Akchagyl Sea. However, even a fairly long period of influence of supergene processes could not completely destroy the oil and gas generating properties of the emerging oil deposits in the exposed strip of the Maikop Formation on the southwestern side of the trough. This, in all likelihood, is also due to the clayey nature of the Maikop formation section: hypergene factors, including the infiltration of fresh surface waters, could not penetrate deeply and completely oxidize the DOM and destroy the formed oil deposits. Therefore, in the Maikop formation on the southwestern flank of the trough, a number of oil fields are currently known (Naftalan, Kazanbulag, Achydere, Terter), characterized by heavy oils in the upper part of the section. There is no doubt that in this zone, due to the above geological and hydrogeological conditions, light fractions of oil were lost in the upper horizons of the Maikop formation and the oil became heavier. In addition, within certain areas, supergene processes left a deeper mark on the physicochemical characteristics of oils.

From the above-described zone in the northeast direction, the Maikop deposits are overlain by the Middle-Upper Miocene (Torton-Sarmat) - Pliocene deposits, and the hydrogeological conditions for the formation and preservation of hydrocarbon deposits in them are improving.

3. Results and discussion

Paleohydrodynamic studies show that the zone of creation of the highest pressures in the Maikop sediments at the end of the Maikop time corresponded to the central part of the Yevlakh-Agjabedi trough. Over the course of geological time, the zone of high-pressure water creation migrated to the northeast. In the modern period, this zone is located closer to the northeastern side of the trough.

In accordance with this, the direction of fluid movement in Maikop sediments was first directed from the central part of the depression to the side parts and centroclines: subsequently, as the focus of the subsidence migrated to the northeastern side, the direction of fluid movement occurred mainly from the northeastern side to the southwestern one.

Since there are no regionally permeable layers in the section of Maikop deposits, it can be assumed that the movement of fluids was directed mainly vertically. Therefore, the zone of direct contact of Maikop sediments with highly permeable Cretaceous and Eocene sediments should be of increased interest in relation to oil and gas prospects.

To determine the oil and gas potential of Maikop sediments, hydrochemical data were also used. At the same time, special attention was paid to the mineralization and type of water, the content of organic acids in them, Corg, iodine, bromine, boron, ammonium, sulfates; from the coefficients

$$\frac{rNa}{rCl}, \frac{\sum(HCO_3 + CO_3)}{Cl}$$

The degree of prospectivity of Maikop deposits according to hydrochemical indicators naturally increases from the southwestern side of the trough to the northeastern one. For example, the content of salts of organic acids naturally increases from 286 mg/l on the southwestern side to 8994.7 mg/l on the northeastern side. In the same direction, the mineralization of formation waters increases, its carbonate content increases, and the content of sulfate ions decreases.

Analysis and generalization of general hydrogeological, paleohydrogeological, hydrochemical, hydrodynamic, geothermal indicators allows us to identify highly promising, promising and low-promising zones within the Yevlakh-Agjabedinsky trough based on Maikop deposits (Figure).

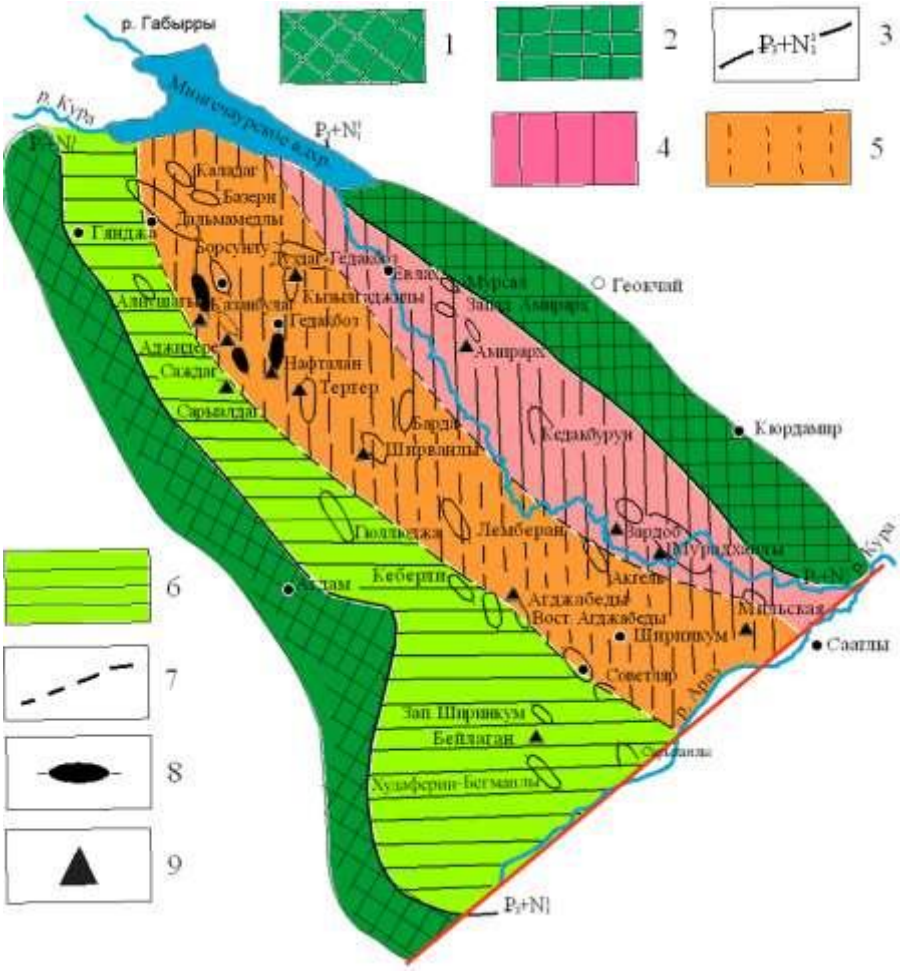

Figure 1. Yevlakh-Agjabedi trough. Map of oil and gas potential prospects for Maikop deposits based on hydrogeological indicators. 1 – zone of absence of the Maikop Formation; 2 – relative rise; 3 – boundary of distribution of Maikop deposits; Oil and gas potential zones: 4 – highly promising; 5 – promising; 6 – unpromising; 7 – border of promising zones; 8 - oil deposits; 9 – oil and gas shows.

4. Conclusions

According to hydrogeological criteria, the degree of oil and gas potential of the Maikop deposits of the Yevlakh-Agjabedin trough increases from the southwestern to the northeastern side.

Within the Yevlakh-Agjabedinsky trough, highly promising, promising and unpromising zones are distinguished in Maikop sediments.

Conflict of interest
The authors declare that they have no conflict of interest in relation to this research

References

1. Ali-zade, A.A. Maykop suite of Azerbaijan and its oil content. Baku: Aznefteizdat, 1945, 489 p.
2. Ali-zade, A.A., Aliyev, A.K., Kurban-zade, A.M., Agalarov, N.M. On the issue of searching for new deposits of medicinal oil Naftalan in the Kirovabad oil and gas region. Oil and Gas Geology and Geophysics. Moscow, 1972, vol. 8, pp. 23-26
3. Bogomolov, G.V., Bars, V.A., Buyalov, N.N. et al. Methodological guide to hydrogeological, hydrochemical and microbiological studies to assess the prospects for oil and gas potential of the subsoil. Moscow, Gostoptekhizdat, 1961.
4. Gadzhiev, F.M., Movsumova, Z.A. Hydrochemical zonality of groundwater in the Lesser Caucasus foothills. “Theses of the scientific and practical conference of young scientists and postgraduates” dedicated to the 70th anniversary of AzNIPIneft, Baku, 1998.
5. Gadzhiev, F.M., Medzhidova, E.G. Classification of formation waters of the Maikop series and Chokrak horizon of the Muradkhanly deposit by a graphical method (in Azerbaijani). Proceedings of the Republican scientific conference "New research methods and forecasting of promising areas of mineral resources of Azerbaijan" May 25-26, 2000, publishing house of Baku University.
6. Gadzhiev, F.M., Huseynov, G.A., Medzhidova, E.G. Main hydrogeochemical features of the Muradkhanly oil field (in Azerbaijani). Scientific works of AzNIPIneft, no. 4, Baku, 2005.
7. Geology of Azerbaijan. Oil and gas. Baku, Nafta-Press, 2008, vol. 7, p. 672.
8. Zorkin, L.M., Subbota, M.I., Stadnik, E.V. Oil and gas exploration hydrogeology. Moscow, Nedra, 1982, p. 216.
9. Kartsev, A.A., Vagin, S.P. The role of sedimentation waters in the formation of formation waters of large artesian basins. Geology and exploration, 1966, no. 8, pp. 93-98
10. Mekhtiev, Sh.F., Akhmedbeyli, F.S. Naftalan. Baku, Aznefteizdat, 1959, 130 p.