

GEOLOGICAL AND GEOCHEMICAL PROMISES OF OIL AND GAS PROSPECTS OF THE WEST GEORGIA AND GEORGIAN SECTOR OF THE BLACK SEA BASIN

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Summary

Oil and gas perspective territories of Georgia are coincide mainly to the intermountain depression, located between mountain constructions of the Greater and Lesser Caucasus.

In the sedimentary cover of the Mesozoic-Cenozoic age source rock sequences are distinguished, which could generate enough amount of hydrocarbons (HC) to form significant oil and gas fields.

For the present only 15 oil and 1 gas fields are discovered in Georgia. The most high discharge fields are enclosed in the fractured volcanic-sedimentary sediments of Middle Eocene.

Discovery of the sufficiently large oil and gas fields is connected to zones of prevalence of the fracture reservoirs in the volcanic-sedimentary sediments, which are widespread on the whole territory of the depression and on its sea continuation, as well as with zone buried under the regional thrusts and overthrusts.

Introduction

Intermountain depression of Georgia that has good prospects on oil and gas is characterized by the existence of two basins-Rioni on the west and Kura on the east. The Oligocene-Quaternary molasses fills them and they are separated by the Dziruli-Imereli uplift, which is formed mainly by rocks of Jurassic-Lower Paleogene age.

Analysis of structure data and geochemical properties of the sedimentary cover as well as parameters of the discovered fields and regularity of their placing make it possible to plan perspectives of discovering of the new fields in Georgia.

Tectonic description

Rioni basin forms the eastern encircle of the Black Sea basin, where thickness of the sedimentary cover within the Georgia is more than 11 km. Following zones are covered by the molasses (thickness about 3.5 km):

In the south (Guria zone) thick Paleocene-Eocene terrigenous and volcano-sedimentary folded complex of Adjara-Trialeti rift, one of the tectonic elements of the Lesser Caucasus;

In the north (Kolkhida zone) less thick, slope folded Jurassic-Eocene volcano-sedimentary and carbonated thickness of the Trans-Caucasian micro plate.

Thrusted to the north direction Guria zone overlaps south part of the Kolkhida zone and forms overthrust. In the offshore extends in southwest direction till Trabzon (Turkey) meridian keeping up the inherent the onshore construction.

On the offshore continuation of the Kolkhida zone Mesozoic sediments form big Gudauta-Ochamchira uplift, which turned into Shatsky bar.

The Kura basin, which is the west segment of the South Caspian mega-basin, in Georgia takes depression forms, named Kartli (on the west), Gare-Kakheli (on the southeast) and Alazani (on the northeast). The thickness of the sedimentary cover of the basin is 14-15 km in which the molasses thickness is 5-6 km.

In Kartli and Gare-Kakheti depressions the molasses covers the dipped areas of the Trans-Caucasian micro-plate, which is characterized by the Jurassic-Eocene sedimentary cover.

On the junction of those depressions in the stretch eastern from the town Tbilisi, molasses cover of Cretaceous-Eocene age terrigenous-carbonate and volcanogenous-sedimentary fold sediments of the eastern end of the Adjara-Trialeti rift. Northern flanks of the considered depressions are covered from the north by the Cretaceous-Paleogene flysch of Greater Caucasus.

Upper molasses (upper Miocene-Pliocene) of the depression under the pressure of the flysch masses are dislocated to southern direction. Their dislocation scales increased from west to east and gradually spread all over the eastern part of the Kartli depression, part of the eastern end of the Adjara-Trialeti rift and whole Gare-Kakheti depression.

Alazani neotectonic depression was formed in Late Pliocene as a result of dipping of the part of the Greater Caucasus flysch allochthon, which overlapped recently northern slope of Kura basin.

Oil-Geological peculiarity of the sedimentary cover

In the sedimentary cover of intermountain depression of Georgia several strategic units (Table 1) can be considered as possible source rock, which could generate enough amounts of HC to form oil and gas fields with considerable reserves.

Table 1

#	Tectonic Zone	Rock's Age	Lithology	Maturity of the Source Rock	Content of C organic, %	Content of HC, gr/cm ³
1	Rioni depression	N ₂ ¹ -N ₁ ²	Clay	*PK ₃ -**MK ₁	0.4-0.5	170-201
2	Rioni depression	P ₃ -N ₁ ¹	Clay	PK ₂ -MK ₁	1.8	204
3	Rioni depression		Marl	MK ₁₋₃	0.2-2.7	127-260
4	Rioni depression	Y ₂₋₃	Clay, mudstone	PK ₃ -MK ₄	0.1-2.7	50-380
5	Kura depression	N ₁ ³ -N ₁ ²	Clay, siltstone	PK ₂₋₃ -MK ₂₋₃	0.1-1.0	50-320
6	Kura depression	N ₁ ¹ -P ₃	Clay	PK ₃ -MK ₂	0.3-1.4	150-730
7	Kura depression	P ₂ ³	Clay	PK ₃ -MK ₂	0.3-1.5	240-500
8	Kura depression	P ₂ ¹ -P ₁	Mudstone	MK ₅	0.2-0.7	70-95
9	Kura depression	K ₁ ap-al	Marl	MK ₃₋₅	0.2-1.7	150

*Protokatagenesis

**Mezokatagenesis (by H.B. Vassoievich)

In the Rioni depression onshore presently small oil fields are discovered in Upper Jurassic sandstones (Okumi), in Upper Cretaceous fractured limestones (Western Chaladidi) and in sandstones of the Upper Miocene and Lower Pliocene (Supsa, Shromisubani-Tskaltsminda). On the offshore no drilling was conducted yet.

In the Kura depression the high-debit fields were discovered in the eastern end of the Adjara-Trialeti rift covered with the molasses, where the fractured volcanic-sedimentary sediments of the Middle Eocene are productive (Samgori-Patardzeuli-Ninotsminda, Teleti and others). The rest of the small, low-debit fields are connected to the sandstone-conglomerate formations, enclosed in the upper molasses tectonic scales and folds, thrust over to the southern direction.

Oil and Gas Perspectives

In the Rioni depression and its marine extension the perspectives of the new fields are mainly connected to the Mesozoic volcano-sedimentary and carbonate sediments on the north; volcano-sedimentary and terrigenous sediments of the Paleogene and Neogene on the south. The perspectives of the marine part of the basin are evaluated above, because in this direction, apparently, the reservoir properties of the possibly productive rocks, as well as the volumes of the source rock and sizes of the possible traps are enhanced.

In the Georgian part of the Kura depression new oil fields can be discovered in the volcano-sedimentary sediments of the Middle Eocene (eastern edge of Adjara-Trialeti rift and its surroundings), in the volcano-sedimentary and terrigenous sediments of the Paleogene and Neogene covered with flysch allochthon (northern board of the depression), in the sandstone-conglomerate packs of the upper molasses (Gare-Kakheti depression).

Summary

While the exploration works are conducting in Georgia it is necessary to pay attention to the following circumstances:

1. The results of the already conducted exploration works on the territory of Georgia showed that the high-debit fields can be discovered mainly in the fractured volcano-sedimentary and carbonate reservoirs, possibility of existence of which is high in the Jurassic, Cretaceous and Eocene sediments.

2. High oil and gas potential of the zones with the thrust-covering tectonics is proved in many regions of the world. There are several such zones in Georgia: southern part of the Rioni depression connected through overthrusts to the Adjara-Trialeti rift; northern board of Kura depression, buried under the flysch allochthon; area of the development of the molasses overthrusts and thrusts over in the Kura depression itself.