Contribution of I. O. Brod to oil and gas geological research in the Eastern Ciscaucasia

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Abstract. The article dwells upon the organizational and scientific activities of I.O. Brod being a famous scientist in the field of oil and gas geology. His contribution to the development of scientific research and exploration for oil and gas in the Eastern Ciscaucasia in the 30s and in the first half of the 50s of the 20th century has been disclosed. Brief biographical details (birth, studies, positions, etc.) and data from his report at the 17th International Geological Congress (IGC) held in 1937 are given. The activities of I.O. Brod with regards to studying the geological structure and oil and gas content of the Eastern Ciscaucasia regions (Dagestan, Chechnya, etc.) are characterized. It is noted that the generalized text and graphic geological materials of the expedition enabled to identify the main features of the geological structure and assess the prospects for the oil and gas potential of the Mesozoic stratigraphic complexes and served as a scientific justification for the further increase in regional, geological prospecting and exploration work for oil and gas in the region under consideration. Listed are oil and gas fields and deposits (Achisu, Khoshmenzil, Izbierbash, Duzlak, Eldarovo, etc.) established as a result of geological exploration under the leadership of I.O. Brod. The focus in describing the scientific and organizational activities of I.O. Brod in the early 50s of the 20th century is on large-scale studies by the integrated south geological expedition in the North Caucasus under his leadership with the participation of many specialized scientific, educational and industrial organizations and institutions. In conclusion, the main monographic, educational and popular scientific works of I.O. Brod are listed and accompanied by a brief reflection of their content and significance.

1. Introduction

Many well-known geologists, mining engineers and oil scientists – F. Koshkul, N.N. Barbot de Marni, A.M. Konshin, G.P. Mikhailovsky, N.I. Andrusov, K.P. Kalitsky, D.V. Golubyatnikov, V.P. Rengarten, E.M. Yushkin, I.N. Strizhov, I.O. Brod and others – have worked in the North Caucasus since the beginning of industrial oil production and have left an imprint in the development of the...
theoretical foundations and practical studies of geological exploration for oil and gas. The results of their geological studies played an important role in the development of exploration for oil and gas in the North Caucasus in the first half of the 20th century. This article is devoted to the creative activity of I.O. Brod being one of these prominent people. Various aspects of the life and scientific activities of Professor I.O. Brod were covered in the works of I.V. Vysotsky, N.A. Eremenko et al. This article focuses on I.O. Brod’s contribution to studying the oil regions of the North Caucasus as well as on exploration, research and thematic work organization.

2. Brief biography and beginning of scientific and pedagogical activity
Ignatiy Osipovich Brod was a famous oil geologist, professor, doctor of geological and mineralogical science. He was born in Saratov in 1902. I.O. Brod studied at the University of Saratov for one year and then in 1921 he transferred to the St. Petersburg Mining Institute, which he graduated from in 1928. He began his labor activity in his student years as a collector (in 1921), and later (from 1925) spent geological exploration in Dagestan, Grozny district and other regions under the guidance of famous geologists K.P. Kalitsky, D.V. Golubyatnikova and others. In 1927-1928 I.O. Brod published his first scientific works [1,2]. After graduation, he headed the work of the geological parties of the Oil Geological Prospecting Institute in Southern Dagestan [13]. Thus, in 1929, a group of geological parties was organized to conduct production work in Dagestan, I.O. Brod was appointed the scientific and technical leader. Geological exploration work was carried out for oil, gas and iodine-bromine waters in southern Dagestan. They covered almost all oil-bearing and promising areas of South Dagestan. Directly I.O. Brod was engaged in the geological study of the Kayakent, Berekei, Izberbash and Achisu areas together with N.N. Rostovtsev and V.A. Znamensky. He developed a plan to drill promising areas in order to assess their oil and gas potential.

In 1930s, I.O. Brod was a famous oil geologist. In 1937, he co-authored two guides for geological excursions around Checheno-Ingushetia and Dagestan for the 17th session of the International Geological Congress (IGC). For the same session, he presented a report “On the classification of oil deposits by their forms” [4].

In his report, he noted that there was no unified classification of all oil fields and its development required results of exploration and development of all fields in the world. Brod’s classification was based on materials from the study of oil deposits in the North Caucasus associated with anticlinal structures, zones of sand layers, pinch-out and buried landforms. I.O. Brod subdivided all identified oil deposits into following groups: closed deposits associated with brachiform and quaquaversal anticline; screened deposits associated with upthrown and underthrust parts of anticlines; hanging deposits. Abstracts of the reports provide brief information about oil deposits within specific areas and regions of the North-East Caucasus [5].

As noted by many researchers of I.O. Brod’s creative heritage, a combination of research, teaching and production activities was typical for him [5]. In 1933, I.O. Brod was appointed the head of the Groznofterazvedka group and deputy chief geologist of Groznftekombinat. From 1935 to January 1937, he served as chief geologist at Groznftekombinat [6,7]. Later he was appointed chief geologist of the Dagneft group. Simultaneously, from 1934 to 1937, I.O. Brod headed the Department of Geology and Exploration of Oil and Gas Fields at the Grozny Oil Institute. From the beginning of 1937 until October 1939, he was a professor at this institute. I.O. Brod occupied the listed positions of responsibility in the structure of the oil and gas industries in Chechnya and Dagestan and supervised all geological exploration work for oil and gas in accordance with the plan developed by him.

The results of scientific and industrial activities of I.O. Brod from 1933 to 1939 are reflected in more than 60 published works [8]. In one of the works for 1934 [8], an assessment of the state of exploration work in Grozneft was given, with the definition of specific exploration tasks.

On the basis of a critical analysis of statistical data on exploration work, I.O. Brod noted: “These figures, better than any words and resolutions, explain the absence in Grozneft of funds prepared for exploitation, characterizing an insignificant exploration footage with insufficient attention to Grozneft exploration and the implementation of this footage is a poor organization exploration work” [4]. He
described the main exploration areas with the definition of priority objects and tasks for further exploration, thereby refuting rumors about the fading of the Grozny oil region. The article also touches upon questions about the prospects for oil and gas content of the vast territory of the flat part of the Eastern Ciscaucasia. Subsequently, the results of exploration work confirmed the forecasts of I.O. Brod about the high prospects of the mentioned territory.

As a result of prospecting and exploration work in the Eastern Ciscaucasia, mainly under the leadership of I.O. Brod, the following fields and deposits were discovered: Achisu gas and oil field, Khoshmenzilskoye gas field, Izberbash oil field, Duzlak and Eldarovskoye gas and oil fields, and others. Within the listed fields, oil and gas deposits were established in the Miocene and Maikop sediments.

3. Organizational and production activities in 1950s

Despite the significant volumes of geological exploration for oil and gas, in the early 1950s a critical situation arose with the reproduction of the raw material base of the oil industry in the North Caucasus. Primarily, this was due to the limitedness of the object of research both in space (Forefront Ridges, Black Mountains, South Dagestan, etc.) and in depth (mainly Tertiary deposits). The lack of a scientific base prohibited a widespread of geological prospecting and exploration work on the vast flat territory of the North Caucasus and into the deep horizons of the section. In this regard, the Complex North Caucasian Oil Expedition of the USSR Academy of Sciences was organized with the objective to assess the prospects for oil and gas potential and develop a strategy for the development of the oil and gas industry of the North Caucasus based on scientific analysis and generalization of all accumulated geological material in 1952.

The complexity of research (a combination of various methods), a wide coverage of new territories and a range of depths were the distinctive features of scientific research in the North Caucasus. Complex geological expedition led by Professor I.O. Brod in 1952-1955 provided analysis and generalization of all available geological, geophysical and field materials. It also conducted its own research to correlate the factual materials characterizing the geological structure and oil and gas content. The work was conducted in accordance with the master plan, which involved the research on 12 topics [9]. The research was rather immense, which is evidenced by the fact that to carry out work only on the first topic (drawing up summary maps), scientists and production workers from six specialized organizations and institutions – GrozNII, VNIIgaz, State Research Institute, the party of the Department of Geology and Geochemistry of Fossil Fuels, Moscow State University, geological exploration of the Grozneftezarvedka trust, etc. – were involved. The ultimate outcomes of research on the first topic were a consolidated geological map on 17 sheets and a geological-structural map on 14 sheets compiled in 1953-1954.

Graphic material (maps, diagrams, sections, profiles, etc.) illustrating the geological structure and oil and gas content of individual areas, zones and, in general, the entire study area, was grouped into separate albums. A total of 14 albums were issued.

The research results were published in six issues of the expedition’s proceedings under general editorship of I.O. Brod [9-11]. Based on the results of the work of the Complex North Caucasian Oil Expedition of the USSR Academy of Sciences, detailed schemes for comparing the sections of Meso-Cenozoic sediments based on the data of drilling wells with sections of natural deposits were developed, a series of composite paleogeographic, geological and structural maps and profile sections were drawn up, regional, zonal and local oil and gas strata were identified. The joint analysis of all these materials enabled to characterize the main features of the geological structure, the history of development and the oil and gas potential of the region. Accumulated geological materials (textual, graphic, etc.) served as a theoretical basis for the further development of oil and gas production, geological exploration for oil and gas as well as the beginning of the development of the Mesozoic sedimentary complex in the North Caucasus.

From the very beginning of the 1950s, a number of textbooks, monographs and popular science books were published. His textbook (co-authored with N.A. Eremenko) “Fundamentals of Oil and Gas
Geology”, the first edition of which was published in 1950, and the monograph “Oil and Gas Deposits” were reprinted many times and translated into English, German, Polish, Chinese, Rumanian and other languages [12,13]. They clearly presented information about natural bitumen and its accessory minerals, oil and gas as minerals, the conditions of occurrence and patterns of distribution in earth’s womb and in the space of hydrocarbon accumulations, their origin, migration, and classification of oil and gas accumulations. I.O. Brod together with E.F. Frolov also published a textbook “Prospecting and Exploration of Oil and Gas Fields” dedicated to the methodology and technique of geological exploration for oil and gas. He developed a genetic classification of oil and gas deposits and the doctrine of oil and gas basins. The monograph “Oil and Gas Basins of the Globe” was written under the leadership of I.O. Brod. The latter served as a theoretical basis for a comparative assessment of the oil and gas potential of a number of large regions of the world. In different years, I.O. Brod covered a number of large regions being the Volga region, the Urals, Ciscaucasia, Turkmenistan, etc. [14].

In 1952, a book by I.O. Brod and I.A. Eremenko “Secrets of Oil” was issued in an edition of 50 thousand copies. In a popular form the book expounds many questions of the history of oil concept development, oil and gas composition and properties, drilling, geological, geochemical and geophysical methods of prospecting and exploration, etc. [15].

4. Conclusion

Fruitful activity of I.O. Brod contributed to the popularization of scientific knowledge about the geology, oil and gas potential of the Eastern Ciscaucasia. In total, he published more than 260 works in various editions, including 5 monographs, 10 textbooks, 3 non-fiction books. 23 more books were published under his editorship [16, 17]. I.O. Brod’s scientific developments were fundamental in the development of oil and gas geology. Undoubtedly, the scientific and organizational activities of I.O. Brod made an enormous difference in the formation and development of systematic geological exploration for oil and gas and the oil industry of the North Caucasus in the 30s – 50s of the 20th century. In 1947 he was awarded the Order of the Badge of Honor and in 1949 became a laureate of the Stalin Prize of the second degree (1949) for the discovery and exploration of gas and oil fields.

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