

ABSTRACT

PhD Thesis, Degree in Geology and Mineral Exploration (Code 8D07201)

DOCTORAL CANDIDATE: AKYLBAYEVA ASEL
«MINERALOGICAL AND GEOCHEMICAL FEATURES OF THE GOLD
MINERALIZATION OF THE AKZHAL-BOKONSKY ORE FIELD»

Relevance of the work. In recent decades, there has been a clear trend towards an increase in both the demand for gold in the world and its production. The global raw material base of gold deposits is characterized by an abundance of various types of deposits. However, since the early 90s, the development of gold mining has slowed down due to the exhaustion of the richest deposits, a decrease in ore quality and an increase in negative environmental impact.

East Kazakhstan is known for large and medium-sized gold deposits of various origins. Most of the gold deposits here are confined to the structures of the West Kalba metallogenic belt, which has been a source of replenishment of the country's gold reserve for 100 years. Recent work has highlighted the prospects for revaluation of numerous medium-sized and small facilities and the possibility of opening new deposits within its boundaries. Work on the further study of promising gold ore objects can significantly expand the volume of the mineral resource base of the studied region..

Goal of the work. Study of the mineralogical and geochemical features of the gold mineralization of the Akzhal-Bokonsky ore field to identify promising sites for prospecting and evaluation work.

Research objectives:

1. Analysis of the state of Kazakhstan's mineral resource base for gold.
2. Studying the history of the geotectonic development of the Irtysh-Zaisan folded system.
3. The study of the geological structure and features of the gold mineralization of the main deposits and manifestations of the Akzhal-Bokonsky ore region.
4. Establishment of the main geological and genetic prerequisites for the formation and distribution of gold-quartz-sulfide mineralization within the Akzhal-Bokonsky ore field.
5. Development of a model of ore formation of gold ore objects within the Akzhal -Bokonsky ore field.

Research methodology: It consisted in performing field expeditionary work, sampling, collection and comparative analysis of data. A number of laboratory studies have been carried out, including sample preparation and study of the mineralogical composition of ores and host rocks; study of petrographic features of host rocks (optical microscopy); chemical studies of the elemental composition of ores by ICP-MS method.

Scientific novelty of the work.

The research carried out within the framework of the dissertation work has established that the deposits and ore occurrences of the Akzhal-Bokonsky ore region are similar in material composition, the nature of the manifestation of hydrothermal-metasomatic changes. The main criteria for the localization of deposits are highlighted: geotectonic, structural, lithological, igneous, geochemical, mineralogical and metasomatic zonality. The mineralization was found to be confined to the zones of distribution of carbonaceous sedimentary volcanogenic rocks of the Arkalyk, Bukon, Kokpektin formations and to the brecciated effusions of subvolcanic bodies of the Daubai formation.

A well-defined vertical and areal geochemical zonality has been established.

Practical significance of the work.

The practical significance of the research is confirmed by the presence within the studied region of a large number of unexplored ore occurrences, undeveloped or preserved small and medium-sized gold deposits of various genetic types, which gives real opportunities to involve their reserves in further exploitation after further study. The developed regional and local criteria for the placement of gold mineralization within the Akzhal-Bolkonsky ore field can be used in the future to set up prospecting operations.

Main protected provisions.

1. The ore mineralization of the Akzhal-Bokonsky ore field is associated with orogenic events occurring during the Hercynian collision of the Kazakh and Siberian continents. A system of diagonal cow-mantle faults played an important role in the formation of the main gold ore objects, the activation of which was accompanied by the introduction of syncollisional small intrusions and dikes of gabbro, gabbro-diorite, granodiorite and plagiogranite associations.

2. The distribution of deposits and manifestations of gold mineralization of the ABRP is subject to geotectonic, stratigraphic, magmatic and mineralogical control, which allows us to make recommendations and identify promising sites for prospecting and exploration.

3. The model of the formation of gold mineralization is presented as a sequential process of transformation of syngenetic and hydrothermal-metasomatic iron sulfides during the manifestation of disjunctive and plicative tectonics and hydrothermal metamorphism - propylitization, albitization, beresitization of host sedimentary rocks and intrusive formations under the influence of heat and hydrotherms of a deep magmatic body and its derivatives that do not reach the erosive section.

Factual material and personal contribution of the author.

When writing a dissertation, the main material was factual data collected by the author or with his participation in the performance of state-funded research work (fieldwork, writing reports).

The author completed a foreign internship at the V.Sobolev Institute of Geology and Mineralogy SB RAS, Novosibirsk 2020 on the topic "Modern methods of precision laboratory studies of ore minerals". During the internship, a lot of work was done aimed

at the analytical part of the dissertation. The author personally analyzed and studied a number of monographic, literary and reference data aimed at studying the features of the gold mineralization of the Akzhal-Bokon ore field. When writing this work, materials collected personally by the author during field work at the Akzhal, Vasilvskoye, Boko deposits and the Tokum, Yuzhnoye, Koi-Tas, Zhenishke ore occurrences were used. Some actual materials and samples on the deposits were provided to the author by fellow geologists working at the above-mentioned sites. The actual material and photos of the samples are presented in the dissertation work. Sampling and sample preparation (carried out within the framework of the research project "Technology of advanced assessment of gold deposits using modern methods of mineralogical mapping"). Mineralogical studies and the study of the chemical composition of rocks and ores were carried out by the author within the framework The program of targeted financing BR10264558 "Scientific assessment of the investment attractiveness of structures in Kazakhstan promising for the identification of mineral deposits".

Approbation of work.

The author's personal contribution lies in carrying out the bulk of theoretical and experimental research outlined in the dissertation work.

On the topic of the dissertation work, 11 scientific works were published, including: 1 (one) articles in foreign peer-reviewed journals, 5 (five) in publications recommended by KOKNVO RK, 5 (five) theses in the collections of the International Scientific and Practical Conference.

- In journals included in the list of recommended publications of the KOKNVO RK:

1. Akylbaeva A.T., Mizernaya M.A., Mizerny A.I., Kapzhaparova Z.Z. Quartz-vein gold deposits of the West Kalba zone (East Kazakhstan) - prospects for replenishing the mineral resource base. Scientific journal Bulletin of D. Serikbayev East Kazakhstan State Technical University // Bulletin of EKSTU, No. 2. 2019. pp. 3-8. ISSN 1561-4212.

2. Mizernaya M.A., Dyachkov B.A., Akylbaeva A.T., Miroshnikava A.P., Zhunusov A.A. Gold-sulfide deposits in the black shale formations of East Kazakhstan are a promising source of precious metals. Scientific journal Bulletin of D. Serikbayev East Kazakhstan State Technical University // Bulletin of EKSTU, No. 3. 2019. pp. 43-47. ISSN 1561-4212.

3. Mizernaya M.A., Miroshnikova A.P., Akylbaeva A.T., Chernenko Z.I. Small and medium-sized gold deposits are a promising direction for the development of the mineral resource base of gold in East Kazakhstan. Scientific journal Bulletin of D. Serikbayev East Kazakhstan State Technical University // Bulletin of EKSTU, No. 4. 2020. From 9-14 . ISSN 1561-4212.

4. Akylbaeva A.T., Zikirova K.T., Mizernaya M.A., Kuzmina O.N., Miroshnikova A.P. Problems of replenishing the mineral resource base for gold in East Kazakhstan // Proceedings of Karaganda State Technical University, №4.2021. C.99-105. ISSN 1609-1825 ISSN 2710-3382.

5. Mizernaya M.A., Mizerny A.I., Akylbaeva A.T., Miroshnikova A.P., Joyashish Thakurta Complex gold and rare metal mineralization of Kazakhstan // Proceedings of Karaganda State Technical University, №4.2022. C.195-202. ISSN 1609-1825

ISSN 2710-3382.

- In an international scientific publication included in the Scopus:

1. M. Mizernaya, A. Miroshnikova, A. Pyatkova, A. Akilbaeva. The main geological-industrial types of gold deposits in East Kazakhstan. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu (Ukraine), №5, 2019 – pp. 5-10. Scopus, SJR 2016:0,193. ISSN 2071-2227, E-ISSN 2223-236, <https://doi.org/10.29202/nvngu/20195/2>.

- In materials of international conferences:

1. Mizernaya M.A., Akylbaeva A.T., Problems of development of medium and small quartz-vein objects of the East Kazakhstan gold belt. The subsoil of Kazakhstan is the basis for the stability and prosperity of the country. Materials of the International scientific and practical conference dedicated to the 120th anniversary of K.I. Satpayev on April 12, 2019. - Ust-Kamenogorsk, EKSTU, 2019. – C. 16-20. ISBN 978-601-208-552-5.

2. Dyachkov B.A., Akylbayeva A.T., On the criteria for predicting gold mineralization in the Zaisan structural zone (East Kazakhstan). The creativity of young people contributes to the innovative development of Kazakhstan. Materials of the V International Scientific and Practical Conference of students, undergraduates and young scientists.- Ust-Kamenogorsk, EKSTU, 2019.- C. 17-20. ISBN 978-601-208-661-4.

3. Dyachkov B.A., Mizernaya M.A., Zhunusov A.A., Kuzmina O.N., Ageeva O.V., Akylbaeva A.T., On mineralogical and geochemical prospecting indicators of gold ore objects (East Kazakhstan). Problems of geology and the expansion of the mineral resource base of the Eurasian countries. Materials of the international scientific conference.- Almaty, Satpayev University, 2019 C. 232-243. ISBN 978-601-332-461-6.

4. Pyatkova A., Mizerny A., Miroshnikova A., Mizernaya M., Nurshyikova G., Chernenko Z., Akylbaeva A. Gold-sulphide mineralization or Rudny Altay (Kazakhstan). The International Scientific Conference. «Challenges in Applied Geology and Geophysics: 100th Anniversary of Applied Geology». - AGH University of Science and Technology, Krakow, Poland, 2019.

5. Mizernaya M., Akylbaeva A., Thakurta J., Murgia E. Recent developments on the origin of gold mineralization in East Kazakhstan. 15th Biennial Meeting of the Society for Geology Applied to Mineral Deposits 27 - 30 August, Glasgow, Scotland 2019.-P-857-859. ISBN 978-0-85261-963-6.