ANNOTATION

Theses for the PhD. degree in specialty: 6D070600- "Geology and exploration of mineral deposits"of

Dautbekov Diyas Orazkhanovich

REGULARITIES OF THE EPITERMAL GOLD-SILVER DECLINE IN THE JUNGARA-BALKHASH REGION AND ITS PERSPECTIVES

The thesis is devoted to a very promising epithermal gold-silver geological-industrial type of gold deposits.

1. **The urgency** of work on gold deposits is determined primarily by the generally recognized high importance of gold in the world economy and therefore the continuing demand for it. In this regard, the increase in the mineral and raw materials base of gold in Kazakhstan, which ensures its production in the year only in the amount of 30-35 tons, is certainly a top-priority task, the earliest possible solution of which is possible only through the involvement of prospective, "breakthrough" geological industrial types (GIT) of gold deposits. Epithermal gold-silver mineralization, the study of which the work is devoted, in recent decades throughout the whole world belongs precisely to such GIT for a number of reasons: **firstly**, the development of deposits of this type is carried out in an open way; **secondly**, the attractiveness of these deposits is determined by the easy ore dressing, as well as by the associated extraction of Bi, Hg, Te and other useful components; **thirdly**, that, first of all, with the use of highly effective modern methods of processing ore - heap, vat leaching and others. It became possible to develop gold deposits with low concentrations, among which there are large-volume deposits with poor ores belonging to the class of large and very large (Porgera -555 tons, compare sod-0,9 g / t, Poeblo Viejo - 500 tons, compare sod-1 g / t, etc.).

2. **The object of the study** was the epithermal gold-silver mineralization of the Zhonggar-Balkhash fold system (JBFS).

3. **Research subject:** geological features of gold-silver epithermal manifestations of the structure, regional ore mineralization factors and regularities of their location, assessment of industrial prospects of the GPT field of gold.

4**. Purpose of the study.** Establish the basic patterns in manifestation of epithermal gold-silver mineralization, on the basis of which to develop a scientifically grounded set of search criteria for identifying promising areas favorable for the localization of large deposits as a given geologic-industrial type (GIT).

5. **Research objectives.** 1. Collection, generalization and analysis of material on the geology and metallogenic of the concrete structure at the present stage of study. 2. The role of gold mineralization in the general metallogenic specialization of iron ore. 3. Identify the main regularities of gold-silver mineralization in the region. 4. Determine the characteristic ore mineralization factors and search criteria for the epithermal gold-silver mineralization of the region on the basis of typi-

cal deposits of iron ore. 5. Assessment of the industrial prospects of **epithermal gold-silver mineralization of iron ore.**

6. **The method of investigation** is based on the main provisions of the classical complex metallogenic analysis of a particular mineralization, in this case gold and gold-silver, oriented primarily on revealing the links of ore formations with geological ones, establishing the regularities of their location and determining the ore-controlling factors, and ultimately - identification of the most reasoned prospective ore areas and areas where detailed exploration and prospecting for founding the mineable deposits.

7. **Solving** the problems listed above as a result of the research allows the candidate to defend the following main **provisions of the work:**

1. The modern level of geological and metallogenic study of the Zhonggar-Balkhash fold system shows that along with the copper-poly-metallic-rare metal specialization, the gold-bearing aspect of its metallogeny has an equally important role for the industrial prospects of the region. At the same time among the gold ore manifestations of various geological-industrial type (GIT), epithermal gold-silver ones are dominant;

2. The revealed basic regularities of the location and manifestation of epithermal gold-silver mineralization in iron ore, as well as search criteria, largely correspond to those of the major reference epithermal gold-silver industrial deposits of the world. The statement about the leading role of mineralization in this GIT type in the gold content of the iron ore sector confirms the possibility of identifying the industrial significance in the region of the GIT objects.

3. The high intensity of manifestation in the epithermal gold-silver mineralization and its numerous geological analogies with the world objects allow us to assume about the great prospects for the region to identify industrial deposits of this GIT different rank, including large-volume ones. The absence of still large deposits of this type in the region is probably due not only to the almost complete absence of prospecting for this type of mineralization, but also to the incorrect methodology for their study.

4. The preliminary assessment of the industrial prospects in epithermal gold-silver mineralization proves the following objects as primary task for setting up the detailed prospecting works: gold ore Kuder-Akgirek, Altyntas-Kurgantskaya, Sumbylskoye areas and copper-porphyry deposit Sokurka.

8. The protected provisions are formulated on the basis of the conducted research results.

The main results of the work include:

1. The compilation of the catalog about the gold-bearing manifestations of the ZBFS structure with the account of new data for the last 25-30 years that was the basis of the field work programs of 2012 - 2014.

2. Refinement of the formational affiliation of gold ore manifestations in the iron ore, which showed the dominant role of epithermal gold-silver manifestations in the overall gold content of the region.

3. Identification on a statistical basis of the predominant gold ore specialization in Uspenskaya, West, East and South-Tokau, Kotanemel-Kalmakamel structural-formation zones (SFZ), Bakanas and Saryozek-Ilyi megazones, which are the links of the intercontinental coal-Permian Balkhash-Ili volcanic- plutonic belt.

4. Establishment of the maximum number of gold ore occurrences in the North-West sector of the ZBFS, which, however, may be a consequence of the uneven study of the region.

5. Identification of the gold content in a number of copper-porphyry and polymetallic volcanogenic manifestations, following the example of the Mystobe (former copper point of mineralization) deposits and Zhosabaia (former small polymetallic deposit), increases the probability of discovering industrial deposits in the investigated GIT and shows a specific multi-component profile of a numerous epithermal gold-silver manifestations of the iron ore ZBFS massif.

6. Undoubtedly, the positive results should also be attributed to the identification and confirmation in epithermal gold-silver manifestations of the mass-bearing structure ZBFS as the most ore-controlling factors characteristic of some large reference deposits of the world type, which can be safely recommended as a search criteria for the region.

7. Calculation of the forecast resources for a number of epithermal gold-silver manifestations in the concrete structure ZBFS and compilation of scientifically-grounded recommendations for setting up the detailed prospecting works on priority promising areas.

9. The results of the research have a certain **scientific and practical significance.**

The scientific novelty of the research consists primarily in the identification of a set of ore mineralization factors characteristic in the epithermal gold-silver iron ore mineralization ZBFS that allow us to recommend reasonably the setting of prospecting for the detection of Au-Ag deposits as a new type - large-volume objects with poor ores, which in the last 20-30 years are considered as the most promising gold miners of the world.

The practical significance of the work is unquestionable, because for expanding and strengthening the country's mineral and raw materials base, a reliable and scientifically grounded fund of perspective areas and plots is needed, which is now almost completely exhausted, whereas once it is possible to plan on its basis a search- exploration work to open industrially significant gold deposits of a new type.

Practical interest is: 1. The audit of the formational typing of all gold ore occurrences in iron ore ZBFS and the identification on a statistical basis of the leading role within the epithermal gold-silver deposit [118].

2. The map of prospective gold ore areas, zones and sections of the ZBFS, prepared on the basis of the data of the last 20-25 years, is 1: 1000000 [117], com-

piled on the basis of the last version of the Gold Card of the Ferroalloy Card of 1: 500,000 scale [117]. 3. Characteristics and scientifically grounded recommendations for setting prospecting and appraisal work on a number of prospective gold ore areas in all sectors of the ZBFS. 4. Calculation of forecast gold resources for a number of manifestations of epithermal gold-silver mineralization, which increases the investment attractiveness of the region [118-119].

10. **Actual material on the basis of which the thesis and the personal contribution of the dissertation were made**. The dissertation research was carried out within the framework of grant projects of the Institute of Geological Sciences named after K.I.Satpaev by the group of geological and ore formations. The candidate, since 2012, has been directly involved, both in the office and field work stages. 1." Drawing up large-scale forecast maps, sections, diagrams and summarizing reporting materials for the purpose of selecting sites for the production of field works on important ore sites "(2012-2014). 2. "Analysis of the epithermal gold-silver mineralization of the Zhonggar-Balkhash region and allocation of promising areas for the detection of large deposits of this type" (2012-2014) 3. "Identification of promising directions for prospecting mineral deposits on the basis of new data on the regularities of their manifestations in the paleozoids of Kazakhstan "(2015-2017)

Since 2013, he served as chief of the ore formation detachment. In addition to field research, the personal contribution of the thesis is in the processing of geochemical materials by the numerous epithermal gold-silver manifestations of the Zhonggar-Balkhash fold system (JBFS), in the compilation of geological maps 1: 10000 for those objects, for which they did not exist in the materials of their predecessors; compilation of metallogens of structural-formation zones (SPZ); in the collection of materials on the deposits of the GIT to conduct a comparative metallogenic analysis of the epithermal gold-silver manifestations in the iron-ore massif with world reference deposits to identify ore mineral factors characteristic for the Zhonggar-Balkhash region, and in all other studies of the above-mentioned grant projects. Considering the considerable personal contribution of the thesis, all the employees of the group unanimously decided that he had the right for moral and actual performing his independent work on the factual basis of the above projects, additionally having developed a number of tasks that were not included in the named projects.

11. **Approbation of research results.** The results of the research work are published in 18 scientific articles, 2 of which were published in the international scientific journal (Scopus); 8 articles were published in scientific journals recommended by the Committee for Control in Education and Science; 8 articles are published in the collections of International Conferences.

The results of the works were also tested in the form of oral reports at international conferences: in Kyrgyzstan, "Problems of geodynamics and geoecology of intercontinental orogenes." The sixth International Symposium. June 23-29, 2014 Bishkek; in Russia - The Third International Scientific Conference "Correlation of altaiids and uralid: magmatism, metamorphism, stratigraphy, geo-

chronology, geodynamics and metallogenic forecasting", March 29 - April 1, 2016 Novosibirsk; in Uzbekistan - the international conference "Integration of science and practice as a mechanism for effective development of the geological industry of Uzbekistan Republic " and in Kazakhstan in the Institute of Geological Sciences named after K.I. Satpayev, at international conferences "Satpayev's Readings" in 2014, 2015 and 2016.

Structure and scope of the dissertation. The structure of the thesis consists of an introduction, five chapters (1. Geology and metallogeny of the Zhonggar-Balkhash fold system at the present level of study 2. Epithermal gold-silver mineralization of the World and its state of knowledge in the Zhonggar-Balkhash fold system 3. The patterns of epithermal gold-silver mineralization of the Zhonggar-Balkhash fold system and typical deposits of the late Paleozoic volcanic-plutonic belts. 4. Ore-controlling factors and search criteria for the epithermal gold-silver mineralization of the Zhonggar-Balkhash fold system in comparison with the world reference large deposits of the GIT. 5. Forecast of the industrial prospects of epithermal gold-silver mineralization on the basis of established regularities of its manifestation in the structure; conclusion and a list of used sources (from the 121 names). The volume of the thesis is131 pages of text, including 46 drawings, 5 tables.