NIPES

Journal of Science and Technology Research

Journal homepage: www.nipesjournals.org.ng

Compiling Geochemical Maps of Ore Areas of the Territory of Armenia

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Article Info

Keywords:
geochemistry, ore deposits, anomalies, areolas, sampling, ore field.

Received 29 January 2021
Revised 05 February 2021
Accepted 09 February 2021
Available online 01March 2021

https://doi.org/10.37933/nipes/3.1.2021.18

https://nipesjournals.org.ng

Abstract

In the current work, geochemical mapping of ore fields of the territory of Armenia was carried out through introducing highly effective methodology of search and assessment of blind ore fields according to their primary and secondary lithogeochemical areolas. A quantitative assessment of geogenic geochemical anomalies is given. In order to specify the contours of anomalies as well as their prognosis resources, detailing of the more perspective geochemical anomalies with sampling density was carried out.

1. Introduction

Armenia has traditionally been a country of intensive development of the mining industry. Ore deposits of different composition and size are being successfully developed in the region, among them Kajaran copper-molybdenum and Sotk gold ore deposits have unique resources.
In addressing issues of further development of the mining industry of Armenia, it is necessary to consider the specific features of a geological structure of the territory. To date, all the known ore fields of Armenia have been found within the so-called "open" areas where ore-hosting formations of rocks are bare on a surface or are blocked by friable eluvial deluvium and alluvial deposits. As a result of a long-term geological survey and exploitation activities the majority of the deposits coming to a modern erosive surface are explored and processed to a large extent within the territory of the open part of RA.
In this regard, it becomes obvious that the further increase of reserves of mineral raw materials for the mining enterprises of the open areas is possible only due to detection and introduction of deeply hidden industrial accumulation of ores. According to the theoretical construct large ore reserves of non-ferrous and precious metals in the hidden ore bodies and deposits on average is far exceeding the reserves of the deposits of coming to an erosive surface of deposits. It is possible to solve the problem of the search of the hidden ores in Armenia by introduction of a highly effective technique of search and assessment of the blind ore fields according to their primary and secondary lithogeochemical areolas [1].

2.0 Methods of search and assessment of blind and buried deposits

Search and assessment method of blind and buried deposits according to their primary and secondary lithogeochemical areolas has been applied aiming to reveal and assess ore deposits which are weakly developed on the surface. The regularity of uniform geochemical zonality of deposits and their primary areolas [2] served as the basis for the development and implementation of the methodology of the assessment of the level of an erosional truncation of deposits opening to the surface. This methodology allows to differentiate industrial deposits which are poorly eroded and therefore weakly shown on the modern erosive surface. The identification and exclusion from the further detailed exploration activities of the areas of dissected ore mineralization that are not industrially valuable ore reserves has been carried out.
The problem of search and assessment of buried deposits is the most difficult among search-assessment problems. For the solution of the given problem, methods based on the phenomenon of emission of chemical elements [3] were applied.

2.1 Materials

The results of geochemical approbation of bottom sediments on the areas of an open part of the territory of RA (10000 sq.km) in m-be 1:50000 with a density of 8 samples on km^2 have been received. The analysis of the collected samples by method of semi-quantitative spectral analysis on a wide range of elements of indicators (not less than 25 elements) is carried out. Processing of results of the analysis of geochemical sampling for the purpose of creation of monoelement and polyelement (multiplicative) maps of geochemical anomalies with allocation of their geogene and technogenic types [4].
A quantitative assessment of geogene geochemical anomalies, including calculation of their prognostic resources (expected geochemical reserves) is given. For specification of the contours of anomalies and also for their prognostic resources specification of the most perspective geochemical anomalies with an approbation density was carried out. Geochemical sampling for permanent storage for the purpose of possible control analyses and also defining in the samples the presence of new elements (if necessary).

3.0 Results and Discussion

In the present study, map of geochemical anomalies for uranium of Pkhrut ore deposit of Armenia Fig. 1 has been developed based on the results of the processing and analysis of lithogeochemical sampling.
Compilation of geochemical maps of anomalies of ore deposits includes two phases: during the first phase geochemical mapping only of an open part of the Pkhrut ore field of the territory of RA was carried out. The geochemical mapping of an open part is due to the relevance of opening of the new hidden and slightly eroded fields. In the second phase, geochemical mapping of the closed parts of the Pkhrut as shown in Fig.2 ore field of the territory of Armenia was carried out aiming to detect the new buried deposits where ore-bearing rocks were blocked by younger rocks [5] .
It is obvious that the absence of ore fields in the closed areas is explained by the fact that the complex of search methods existing now is not adequate to a problem of detection of similar fields. The objective has been successfully solved with application of the effective search method of buried fields developed on the basis of the discovery registered in 1994. The main point of this discovery is that under buried fields in the surface atmosphere (20-25 cm on the Earth's surface) there is an accumulation of ions of elements which are typomorphic for this type of mineralization.

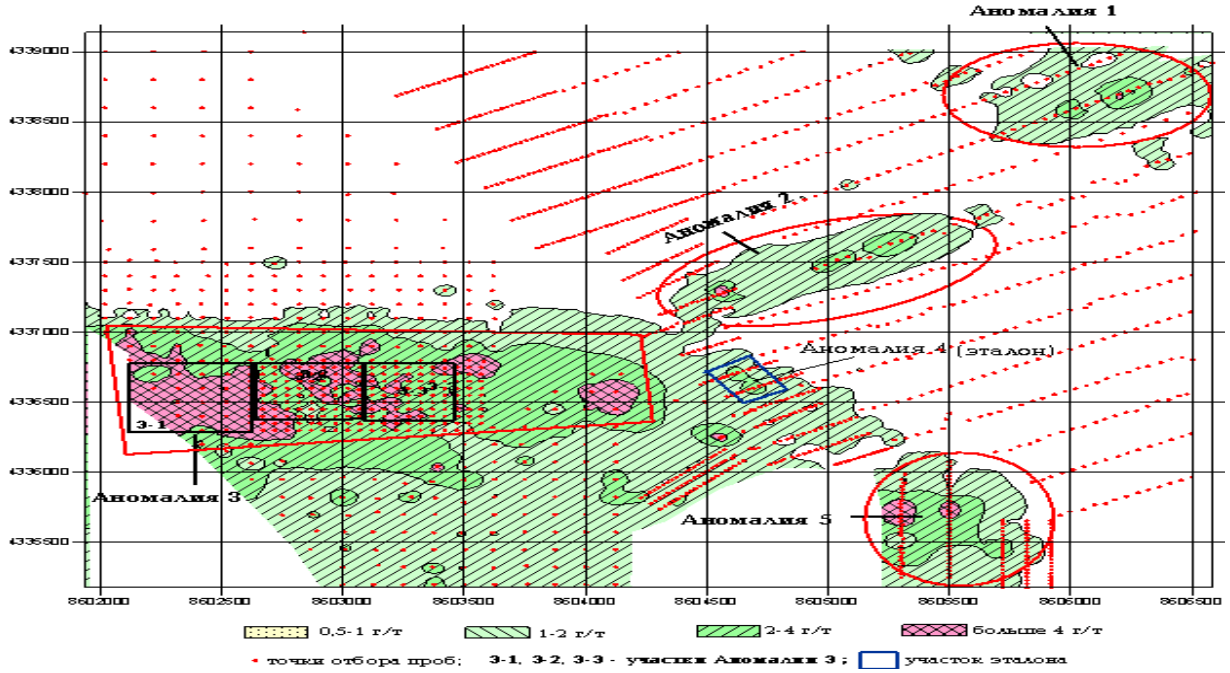

Fig.1 Geochemical map of anomalies according to secondary areolas of dispersal of the uranium of Pkhrut ore field

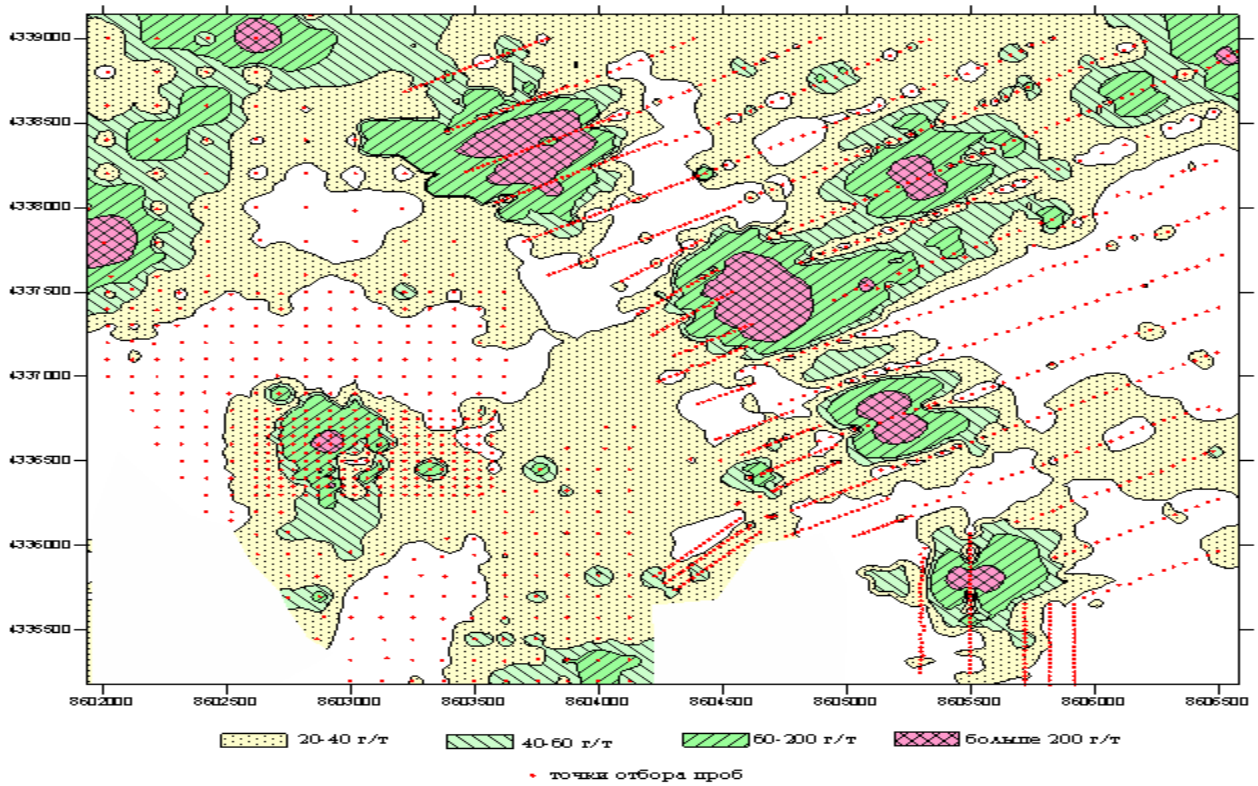

Fig.2 Geochemical map of secondary areolas of lead dispersion of Pkhrut ore fields

This allows to recommend the application of this method to concrete geological metallogenic conditions of Armenia [6] in the closed areas.

It should be mentioned that the differentiation of the areas according to the degree of potentiality will sharply mitigate the investment risks and attract serious investors which is of primary importance for Armenia for further development of mountain metallurgical industry — the most important branch of the economy of the Republic.

4.0 Conclusion

The relevance of this work on search of buried ore bodies and deposits, is defined both by the considerable sizes of the closed part of the territory of Armenia (more than 60% of the territory), and by the prediction of the need of growth of resources of the RA mineral raw materials.
Application of the considered geochemical methodology for prospecting and evaluation of ore deposits by more than 2.5 times reduces the costs (in comparison with traditional methods) for geological exploration. Geological exploration time is also reduced by 2,5 times. The developed geochemical map is forecasting and it also may be applied for issuance of licenses for carrying differential assessment of value of this or that ore fields.
The geochemical map fixing both geogene, and technogenic geochemical anomalies with success can be used as an objective basis both for assessment of the prospects of ore bearing of the revealed geogene anomalies, as well as the nature and intensity of technogenic pollution and also for studying the dynamics of technogenic pollution.

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