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PRIMARY GEOCHEMICAL OREOLS IN THE ROCKS OF THE DOMESOZOIC FOUNDATION OF UZBEKISTAN

(GEOCHEMICAL MAPS 1:1,000,000 SCALE)

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ABSTRACT

Geochemical prospecting for ores is based on the discovery of primary and secondary geochemical halos accompanying the manifestations of any, and not only industrial, ore mineralization, namely: deposits, ore bodies and deposits, small ore occurrences, zones of diffuse ore mineralization of all genetic types - magmatic, pneumatolytic, hydrothermal , metamorphogenic, sedimentary. Primary halos are recorded on the surface and at depth, secondary ones on the surface, as well as near it: below the raft - in water, above - in the surface atmosphere. Differ (Instruction-83, Reference-90 and other documents) types of geochemical halos, depending on the environment in which they are formed, and the corresponding methods for their identification. Increasing the efficiency of forecasting during regional geochemical works, interpretation and assessment of different-rank ore-generating geochemical anomalies in complex landscape-geological conditions, geochemical zoning of territories is given much attention in publications of leading geochemists of the Commonwealth of Independent States countries. At the same time, the technologies of geochemical zoning have not yet been regulated in Russia; in Uzbekistan, a small number of works have been carried out in this direction in the last 20 years.

KEYWORDS: *geochemistry, metallogenic province, metallogenic region, pre-Mesozoic basement, mountainous and foothill areas, geochemical halos and anomalies, forecast, geochemical map, predictive metallogenic analysis of minerageny, ore content, minerals, promising positions.*

DISCUSSION

Geochemical sampling covered the entire territory of Uzbekistan, but with varying degrees of detail. Most, 85-88% of the republic's area is covered with Mesozoic and Cenozoic sediments, with which exogenous deposits are associated. Pre-Mesozoic formations are an environment for localization of endogenous deposits, confined to the mountain systems of the Median (Chatkalo-Kuramin region) and South Tien Shan. Mountain heights with outcrops of pre-Mesozoic rocks occupy about 12-15% in area, the rest is in semi-closed and closed territories. In geological terms, areas of development of thick sedimentary strata are classified as closed. Territories of alternation of open (mountain-fold) and closed areas with a small thickness of the sedimentary cover are classified as semi-closed. Closed areas also include areas with a thick cover of Aeolian deposits of various genesis (sands) and alluvial plains. Searches in closed areas using traditional geochemical methods are ineffective or ineffective; they are exhausted within semi-closed areas. In closed areas, searches are carried out using drilling and original geochemical methods based on the identification of various mobile forms of elements. For closed areas of a two-tiered structure with a Mz-Kz cover of sediments less than 500 m, the objects of geochemical prospecting methods from the surface can be both exogenous ore deposits of solid minerals and, in rare cases, endogenous sub-vertical occurrence, and for areas of development of sedimentary strata more than 500 m, only sedimentary deposits.

The geochemical study of Pre-Mesozoic formations (primary geochemical or endogenous lithochemical halos) is different in open, semi-closed and closed territories:

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- within mountain heights, from the end of the 1950s to the present, geochemical work has been carried out by various methods, the urgent task of the modern stage is the search for non-eroded (hidden) deposits;

- near mountain heights, Quaternary proluvial and alluvial-proluvial formations of the foothill belt and a thin Mesozoic-Cenozoic cover are developed with a relatively shallow occurrence of the pre-mesozoic basement (up to 50-500 m). Within these landscapes, deep prospecting, short-length mapping drilling, deep geological mapping were carried out, but there are also underexplored areas;

- vast closed territories are located in areas with a deep (more than 500-1000 m) bedding of the fold-nappe pre-Mesozoic basement. Studied by wells during the State Geological Survey on a scale of 1:200,000, drilling for oil, gas, uranium, water.

Endogenous geochemical exploration is represented by three main directions: determination of the geochemical specialization of rocks; point and profile sampling within promising areas and fields, carried out in the process of prospecting, appraisal and exploration work, case studies; areal generalizing thematic works on the study of the pre-mesozoic basement of closed areas and within the outcrops of bedrocks of the pre-mesozoic folded base, materials of the GGK, GDP, provided with electronic databases or archival materials. In the open areas of mountain heights, in recent decades, large generalizations of lithochemical surveys were carried out on secondary dispersion halos and sampling of bedrocks, mineralized zones and ores based on the results of prospecting and appraisal work (Kasymov G.Zh., 2012). Therefore, there was no targeted need to create a sufficiently complete base for sampling the indigenous formations of open territories. When creating an areal database on the previously carried out work, they were aimed at collecting information on wells in semi-closed and closed areas for the purposes of geochemical zoning with elements of forecasting promising positions for noble, rare and non-ferrous metals.

According to the project, it was planned to create an areal database on previous work in the amount of 25,000 samples. In fact, an areal database has been created on the previously carried out work on testing the pre-Mesozoic basement in open and closed areas (by wells) within Western Uzbekistan in the amount of 28,800 samples. Automated processing was performed in Statistica and Golden Software Surfer programs for zones 10 (574 samples), 11 (20112 samples), 12 (8125 samples) for 6 elements - Au, Ag, As, Cu, Pb, Zn. In addition, a schematic map of the actual material and a multielement map with elements for forecasting perspective positions were built. Installation of maps is done in the CorelDraw program.

Multivariate statistical analysis. Multivariate statistical analysis was carried out in Statistica and Excel programs in order to study the general statistical features of the distribution of elements, approbation of the areal database before graphic processing, assessment of the regional background, additional editing of the database, preliminary selection of the scale of the contents of elements for constructing halos.

The concentration type of the sample is characterized by the mean, median, and mode. Uniformity-heterogeneity of the distribution of chemical elements is fixed by increased values of dispersion, standard deviation, asymmetry, kurtosis, and a range of contents (min-max). Let us recall the definitions of some terms.

The sampling mode is the value that appears most frequently in the sampling. The mode frequency represents the number of modal values in the sample.

The sample median is the value that splits the sample into two equal parts. Half of the observations are below the median and half of the observations are above the median.

Sample variance - the square of the deviation of the contents, calculated by the formula: $s2=\Sigma (xi-xcp)2/N$, where xi is the content of an element in the sample, xav is the average; N is the sample size (number of samples).

Standard deviation is a commonly used measure of the spread or variability (variability) of data and is the square root of the variance.

Skewness or coefficient of skewness is a measure of the skewness of a distribution. If the skewness is distinctly different from 0, the distribution is skewed, the normal distribution density is symmetric about the mean. The asymmetry of the distribution with a long right tail is positive. If the distribution has a long left tail, then its asymmetry is negative.

Kurtosis or more precisely, the kurtosis ratio measures the "peakiness" of a distribution. If kurtosis is significantly distinguishable from zero, then the density function either has a more rounded peak or has a sharper peak than the normal distribution density peak at kurtosis equal to zero.

The series of relative intensity, characterizing the geochemical spectrum of the studied objects, are ranked in decreasing order of average contents, normalized according to the values of the local geochemical background (Joth.=Smed./Sfon.).

Correlation, factorial and cluster analyzes were carried out in order to identify the leading geochemical associations of satellite elements and indicators of mineralization and indicator mineralization widespread in the area, which are integral characteristics of the studied objects.

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Statistical analysis of regional samples for Eastern Ustyurt (zone 10) and Kyzylkum-Nurata region (zone 11, 12) was carried out.

Eastern Ustyurt. The sample for core sampling of pre-Jurassic basement wells includes 382 samples and contains the results of gold-spectral (gold-metric) analysis and semi-quantitative spectral analysis for 26 elements - Ti, Mn, V, Ni, Co, Cr, Pb, Zn, Cu, As, Ag, Mo, Sn, W, Li, Be, Ba, Sr, Ga, Zr, Yb, Sc. The contents of Sb, Bi, Nb, Ta are mainly below the sensitivity of the method and are present in the database at values equal to half the sensitivity of semi-quantitative spectral analysis; in this case, they were not included in the processing.

Determination of the regional background. In determining the geochemical specialization of rocks, as in the analysis of anomalous geochemical fields, the intensity of the manifestation of enrichment in chemical elements is important, which is estimated in relation to the regional background (fersma) or the system of world clarkes. Regional background abundances of elements were defined as a modal value from the background population. The area of background values was identified using the histogram of the element abundance distribution. Practice shows that most often we are dealing with polymodal distributions, in the conditions of which visual analysis of histograms is an effective technique for searching for geochemical thresholds. Typically, samples from the background population form the main peak in the histogram. Samples from the areas of removal and accumulation form minor peaks and are separated from the background population by significant minima. The minimum to the left of the background is classified as a washout threshold, on the right - the accumulation threshold or minimum anomalous. The value of the regional background for a number of elements (As, Sb, W, Bi, Be, Ta, Nb) can only be considered conditional, since their true contents in rocks are usually below the sensitivity of semi-quantitative spectral analysis, and the boundaries of the background region on the histogram are recorded only with the accumulation region.

The swing diagrams show the minimum-maximum values, the boundary values of the quartiles (25-75%) and the median, for some elements one can observe “outliers” into the accumulation area (Ti, Mn, Cu, As, Au, Ba, Sr, Zr, Ni). According to standard deviations, Pb, Zn, As, Au, Sc are distinguished, having the greatest deviations from the mean. The histograms of the distribution of the concentrations of chemical elements in the samples show the predominance of areas of their sub-background concentrations, while the area of removal is practically absent, and the area of accumulation is mainly represented by low concentrations and is the most representative (approximately> 5% of the sample volume) for Au, Ag, As, V , Mo, Co, Mn. Analysis of histograms made it possible to select the area of the background distribution and to accept (in the working version) as the regional background the modal value of the element content. For most elements, background grades have insignificant differences with the average and median.

Compared to the Clarke of the Earth's crust, the regional background W, Ag, As has an analytical overestimation of the contents by 5-6 times, the regional background of Mn, V, as it seems based on the composition of the host rocks, has an analytical underestimation of the contents by 1.5-2 times, the regional the background of a number of elements characterizes their excessive or deficient content: excess> 1.2 Mo, Be, Pb, Zr; deficiency <0.8 Ti, Au, Co, Ba, Sc, Cu, Sr, Ni. The regional background Ga, Zn, Sn, Cr, Yb, Li has insignificant deviations from the clarke of the Earth's crust and ranges from 0.8 to 1.2.

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