International Journal of Geology, Earth & Environmental Sciences ISSN: 2277-2081
Online International Journal Available at http://www.cibtech.org/jgee.htm
2022 Vol. 12, pp. 188-192/Sharakhmedov et al.
Research Article (Open Access)

GOLD MINERALIZATION IN THE VOLCANOGENIC-SILICEOUS-SLATE COMPLEX OF THE KOSPAKTAU AREA (CENTRAL KYZYLKUM)

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ABSTRACT
The paper describes in detail the geological structure of the prospective area Kospaktau of the Auminzatau mountains (Central Kyzylkum). It is shown that veinlet-disseminated gold mineralization is located in volcanogenic-siliceous-shale formations. The results of geochemical studies are given.

Keywords: *rare-metal mineralization, gold, Kospaktau area, Taskazgan suite, elements, structure*.

INTRODUCTION

One of the directions of expanding the mineral resource base of gold in Uzbekistan is the identification of hidden objects in the developed mining areas. The solution of this urgent national economic problem is inextricably linked with the problem of improving the scientific foundations and methods of forecasting, searching and evaluating gold mineralization. A special role is given to local forecasting, which forms a fund of promising areas for exploration, and predictive assessment of the flanks and deep horizons of deposits.

MATERIALS AND METHODS

The Kospaktau area is located in the Auminzatau mountains. Its geological structure includes deposits of volcanic-siliceous (Taskazgan suite) and shale-terrigenous (Besapan, partly Taskazgan, suites) Vendian complexes of the Lower Paleozoic age. The Taskazgan formation is composed of siliceous rocks (microquartzites), carbonaceous-micaceous and amphibole schists, dolomites and limestones are less common. The Besapan formation is subdivided into two parts: in the lower part, carbonaceous-micaceous shales and metasiltstones, with lenses of siliceous rocks; in the upper layer, there is an interbedding of quartz sandstones, siltstones, and carbonaceous-mica shales with lenses of gravelstones.

The structure of the area under consideration, where the Kospaktau area is located, is determined by the Auminza anticline. The Taskazgan formation is developed in its core, and the wings are composed of deposits of the Besapan Formation. According to the ideas (Yu.K. Bykovsky et al.) the considered anticline is the Hercynian antiform of the Caledonian isoclinal-scaly structures. The strike of the anticline is sublatitudinal. Its northern flank is gently sloping, complicated by numerous folds of higher orders, the southern flank is very steep, almost vertical with frequent overturning of the layers.

Another structure of the region is the large Kospaktau syncline, developed from the rocks of the Taskazgan suite. Its strike is sublatitudinal. The core and wings are complicated by linear, asymmetric, sometimes overturned small folds. These folded structures determined the development of numerous subconformity zones of shearing, brecciation, and fracturing, which are the main ore-localizing disturbances in the Kospaktau area.

Since the 80s of the last century in the Central Kyzylkum, and, in particular, in the Auminzatau region, ideas about thrust-shock tectonic faults have been developed. According to many researchers (I.Kh. Khamrabaev, R. Rakhmatullaev, M.M. Mamurov, A.D. Shvelev, Yu.O. Savchuk, R.Kh. Mirkamalov, M.K. Turapov, etc.), these disorders are considered as the root cause of the above folds, crushing and crushing zones, which are directly related to ore formation. Later secant tectonic faults in relation to the deformation structures discussed above appeared in the area. Most of them have been updated several

times. The largest fault in the region extends in the sublatitudinal direction in the southern part of Auminzatau. The fault is steep, almost vertical. According to it, the Besapan formation is in contact with the Cretaceous formations. The southern side of the fault is lowered by several hundred meters. Another suspected fault is traced in the south of the Kospaktau area. Its strike is also sublatitudinal. Volcanic-siliceous deposits abruptly break off along this fault and their contact with the shale-terrigenous complex of the Taskazgan formation is traced.

There are several steeply dipping faults with a northwestern strike. They are well traced on the surface, they displace sedimentary-volcanogenic strata and early folded deformation zones. Their western sides are thrown up to the first hundreds of meters.

Fractures of submeridional and northwestern strike with steep dip angles are widely developed. They are usually made with veins of quartz, sometimes barite. These quartz veins are similar to those of the Vysokovoltnoe deposit. The Late Paleozoic granitoid intrusion is located in the core of the Auminza antiform. A strip of stocks and dikes of granitoid composition extends to the east of it. The intrusive is one of the links in an extended band of large granitoid massifs stretching northwest from the eastern end of the Kuldzhuktau mountains through the western end of the Auminzatau mountains. Most of these massifs are buried under the cover of Mesozoic-Cenozoic formations. Ore mineralization in the area is confined mainly to terrigenous and volcanogenic-sedimentary complexes, where it develops against the background of a wide range of mineral neoformations associated with folded zones of shearing, crushing, brecciation.

According to A.D. Shmulevich, and others. The granitoid massif was formed later than the main mass of ore mineralization, since being located among wide fields of elevated concentrations of gold, copper, vanadium, tin, as well as numerous (Table No. 1) ore occurrences of these metals, it contains only close to Clark concentrations of these elements. The performed prospecting and thematic works show that the gold ore zones of Kospaktau have a complex structure; they are characterized by rich, but local ore columns; the mineral composition of ore bodies is diverse; their geological positions are heterogeneous.

The vein-disseminated gold mineralization in the volcanogenic-siliceous-schist complex differs significantly from the previously known deposits of the vein and vein-disseminated type. From deposits of the vein type, the mineralization of the considered area of Kospaktau differs fundamentally, since it forms complex deposits with vein-disseminated ores. In Auminzatau, as is known, gold mineralization is associated mainly with the sand-shale complex. The mineralization of the Kospaktau area in the siliceous shale complex has the following distinctive features compared to deposits in which gold is associated with the Besapan (variegated Besapan) suite:

- there is a high density of gold mineralization at the level of industrial ores (0.1-1 standard units). The mineralization of the Tuskazgan formation is more localized, compact, with relatively narrow gold halos;
- geological positions are more diverse in the Taskazgan formation; ore bodies occur within rocks of different composition, in more diverse folded faults;
- mineralization is unevenly distributed within the ore zones; bursts with contents of tens of standard units. are abruptly replaced by barren or weakly gold-bearing areas with grades of 1-2 standard units. (Fig.1,2,3,4);
-Taskazgan ores are characterized by a variety of material composition of ore and associated mineralization even within the same area, which is associated with the frequent alternation of host rocks;

Taking into account these features of the gold mineralization of the Taskazgan formation, the Kospaktau area, a hierarchical system of prospecting features has been identified. Presence of igneous mafic rocks, in particular volcanogenic amphibole schists (ortho-amphibolites), in the thickness of the siliceous-shale complex. At the Kospaktau site, orthoamphibolites make up 30% of the total volume of rocks. Gold deposits in volcanogenic-sedimentary sequences with basic volcanics are known in the USA, Canada, and India (V.I. Smirnov, 1969, S.D. Sher, 1972, 1974). Elevated gold content in seawater by one or two orders of magnitude is noted in areas of underwater volcanism. The gold content in mafic volcanic rocks is naturally higher than in other rocks (D.I. Shcherbakov, 1967). It is likely that the combination of gold mineralization with mafic volcanics in the Kospaktau site is not accidental, apparently due to the initial

removal of gold by the main magma, followed by its movement into favorable traps. Thus, orthoamphibolites in the siliceous schist sequence may be the first signs of gold mineralization.

Deformation areas are often confined to the near-contact part of rock layers of different compositions. Initially, gold concentrations were established in quartz-feldspar-biotite metasomatites after amphibole schists. (Yu.F. Baskakov, S.S. Tikunov and others). Metasomatites are located in the deformation zones of orthoamphibolites in near-contact parts with siliceous shale layers. A number of ore deposits have been identified in the western part of the ore field based on this direct exploratory feature. Gold mineralization in the volcanogenic-siliceous-shale complex at the Kospaktau area is characterized by a large set of productive types of mineralization.

According to the researchers, the abundance of gold-bearing types of mineralization and geological positions of ore deposits is probably typical only for the Kospaktau site, which has undergone long-term deformations at different depths, as a result of which gold has moved away from the parent rocks, probably basic volcanic rocks, and concentrated in various packs, accompanied by various sets of associated minerals.

Table 1: The content of chemical elements in the ores of the Kospaktau area

Samples	**Elements and their content in g/t (in standard units for Au, Ag)**								
	Ag	**As**	**Au**	**Co**	**Cu**	**Mo**	**Ni**	**T**	**V**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
DA-262	1.71	33.6	0.926	3.29	399	30.6	11.9	225	3460
DA -263	1.48	8.18	0.836	70.8	13	7.41	42	7070	290
DA -264	1.13	7.78	0.265	1.09	37.8	37.3	46.1	372	707
DA -265	0.385	3.21	0.0714	0.406	<0.1	11.7	9.16	148	112
DA -266	0.544	9.73	0.123	2.9	<0.1	13.5	24.7	537	250
DA -267	0.562	13.8	0.179	5.07	56.8	30	17.4	225	568
DA -268	0.262	8.93	0.243	3.72	39.2	8.31	35.9	1240	753
DA -269	0.97	8.83	0.598	4.25	181	32.1	21.7	369	2510
DA -271	<0.1	12	0.269	4.91	461	66.3	16.2	505	2180
DA -270	1.31	6.48	0.485	5.11	256	20.1	24	655	1750
DA -272	0.0969	5.78	0.173	2.31	64.4	30	17.3	246	669
DA -273	1.7	8.19	0.114	3.58	35.4	16.2	118	360	262
DA -274	<0.1	125	1.42	47.5	7060	1040	202	897	9560
DA -275	2.32	14.2	0.414	5.23	167	42.7	155	502	958
DA -276	<0.1	7.74	0.509	24.2	296	52.1	94.2	670	607
DA -277	<0.1	18.7	0.626	6.72	208	62.9	59.4	800	1740
DA -278	1	8.52	0.371	12.8	168	57.6	59.8	367	1090
DA -279	0.941	39.7	0.373	34.7	269	191	61.9	201	2690
DA -280	0.0977	16.3	0.308	33.1	151	170	34	184	1890
DA -281	2.93	30.8	0.408	23.4	236	321	156	546	3670
DA -282	2.77	64.9	1.33	289	902	886	227	340	8720
PR-1	1.2	9.2	0.202	2.63	9.4	8.82	31.4	852	111
PR-4	0.45	4.33	0.237	2.99	7.9	15.9	15.6	733	91.8
PR-5	0.214	5.52	0.14	1.71	<0.1	8.01	33.2	525	98.8

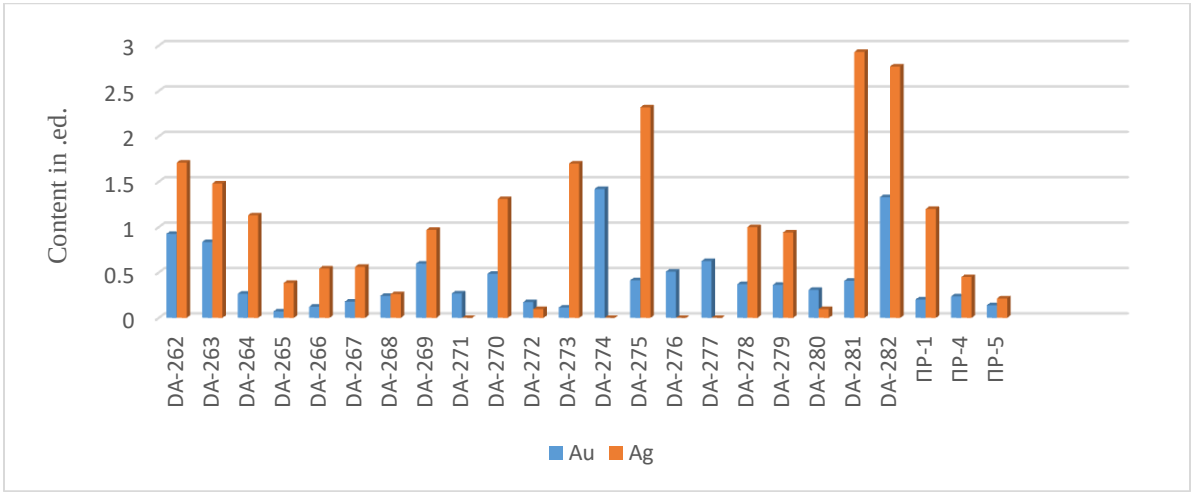

Fig.1. Content of gold and silver in samples

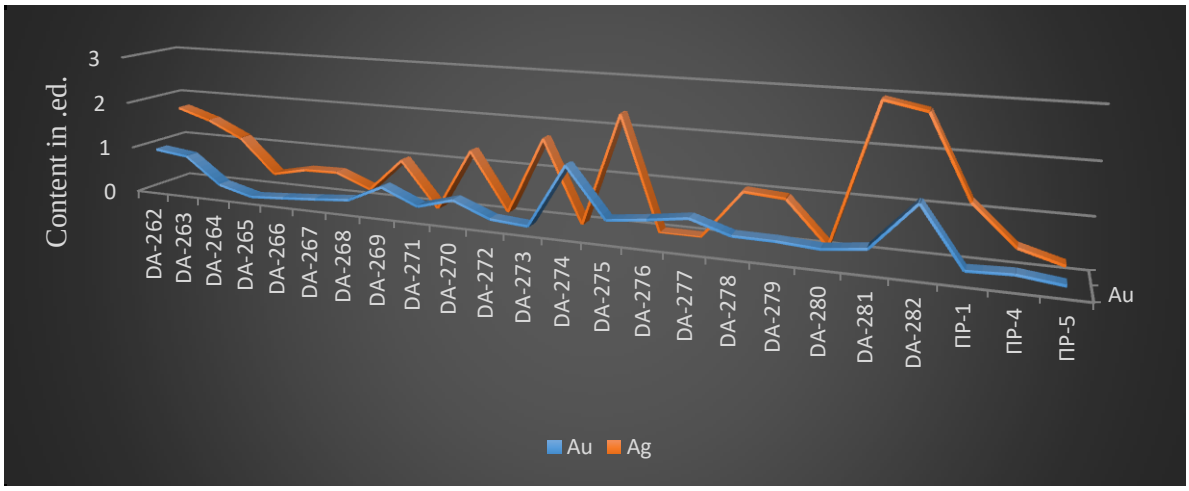

Fig.2. Content of gold and silver in samples

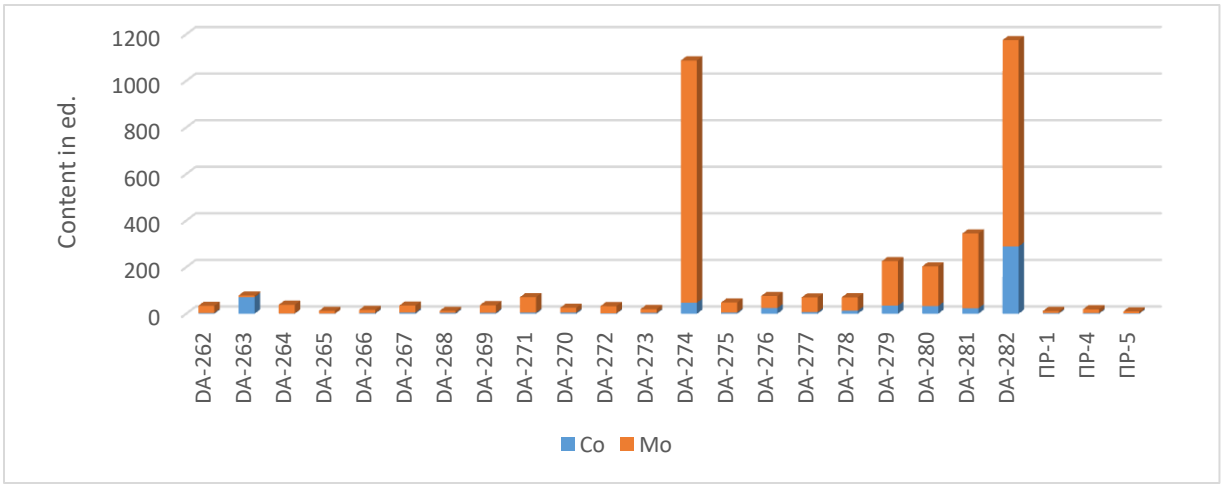

Fig.3. The content of cobalt and molybdenum in samples

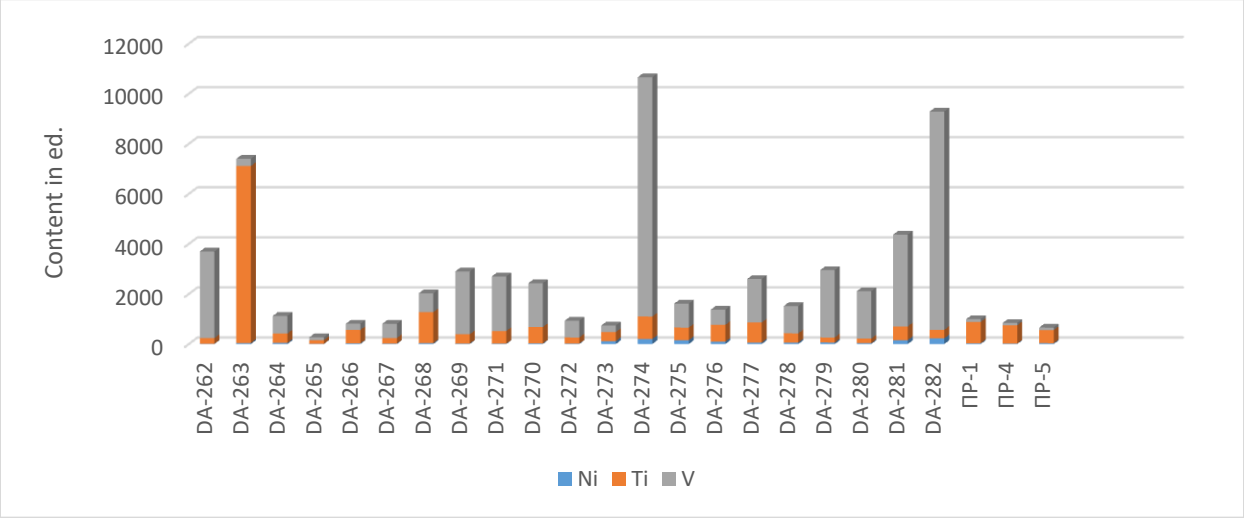

Fig.4. Nickel, titanium and vanadium content in samples

CONCLUSIONS

The ore zone is accompanied by faults NW strike represented by zones of crushing, crushing, ferrugination which occur within rocks of different composition, differently deformed, in more diverse in form with folded disturbances.

According to the compiled diagram of the distribution of elements, it was determined that at the Kospaktau site the zone of local gravimetric anomalies is associated with geochemical halos of gold, molybdenum, vanadium, copper, cobalt, nickel and titanium - characteristic minerals quartz, gold, pyrite, arsenopyrite.

In terms of structural and tectonic manifestations, mineralization is controlled by faults of the northeast and northwest directions, which consist of a zone of fracturing and crushing of rocks, active structures. When found in exploration work, taking into account the observation of the ingress of minerals into tissues, it is recommended to pay special attention to the presence and growth of the structure.

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