International Journal of Geology, Earth & Environmental Sciences ISSN: 2277-2081
An Open Access, Online International Journal Available at http://www.cibtech.org/jgee.htm
2023 Vol. 13, pp. 346-351/Khaliyorov
Research Article

CORRELATION OF ELEMENTS IN THE GRANODIORITE ROCK IN THE SHAUGAZ-KANDIR RANGE

***Khaliyorov Kholmurod Khalmirzayevich**
National University of Uzbekistan named after Mirzo Ulugbek.
**Author for Correspondence: xaliyorovxolmurod@gmail.com*

ABSTRACT
The article presents the chemical composition of the granodiorite rocks of the Almalyk ore field (Shaugaz-Kandir stream) and the general statistical parameters of the distribution of chemical elements in the ore zones and overlying rocks. Correlation relationships of elements in the study area were calculated.

Keywords: *Almalyk, Shaugaz-Kandir, Correlation, Granodiorite, Gold, Copper, Zinc, Porphyry*

INTRODUCTION
The Almalyk ore region is one of Central Asia's largest mining and industrial regions. The presence here of large exploited deposits of copper, lead, and gold, which are in favorable economic conditions, was the reason for conducting a significant amount of prospecting and exploration work in the area, aimed at its detailed study and identification of new industrial facilities. Geographically, the Almalyk ore region belongs to the western part of the Kuraminsky range's northern slope and occupies the Akhangaran River's left side. The region's eastern part is cut by the Saukbulak, Urgaz, Shaugaz, Abjaz, and Kandir rivers.

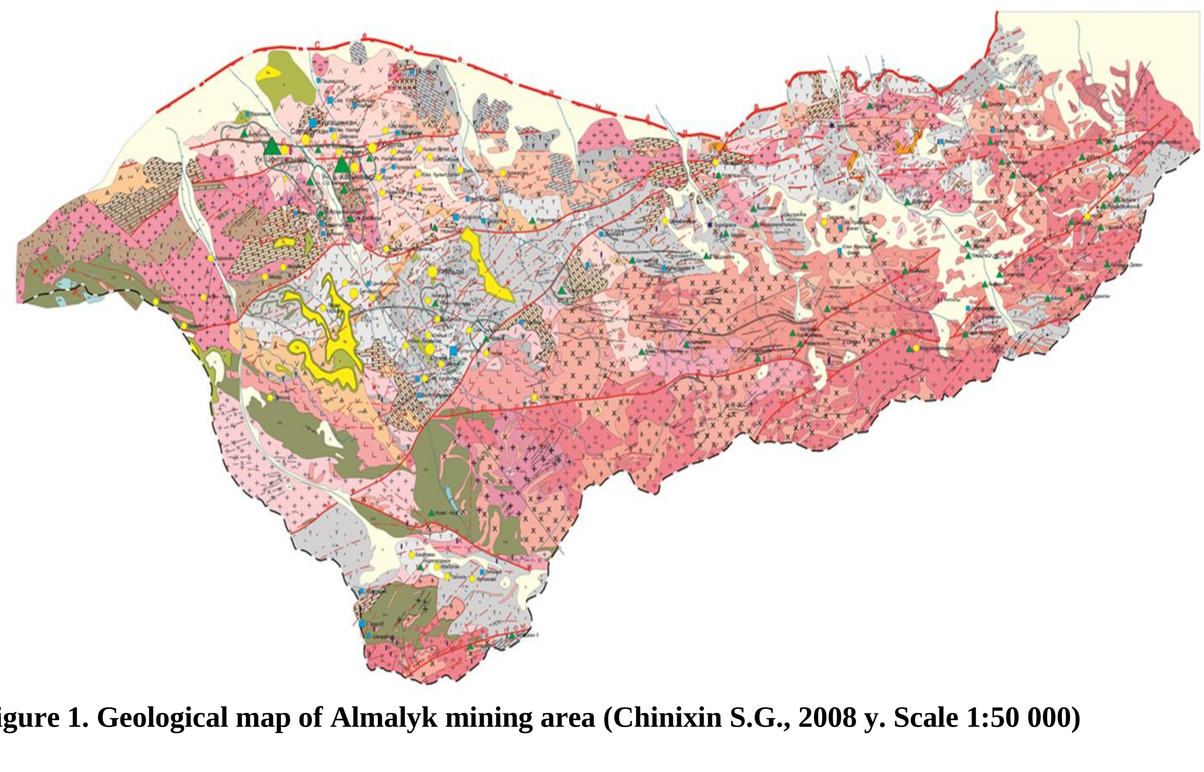

Figure 1. Geological map of Almalyk mining area (Chinixin S.G., 2008 y. Scale 1:50 000)

The area has been considered a promising target for discovering porphyry copper, polymetallic, and gold-silver mineralization for many years. In the eastern part of it, gold-copper-porphyry deposits and ore occurrences have been established [7]. The Almalyk ore field is located in the eastern part of the Beltau-

Kuraminsky volcano-plutonic belt, in the Tashkent region, on the northern slope of the Kuraminsky ridge. The area borders the Republic of Tajikistan in the west, bounded by the Akhangaran River in the north, the Kandyr and Gushsay Rivers in the east, and the Kurama Ridge in the south (Fig. 1). Sedimentary, volcanogenic, and intrusive formations are widely developed in the region.

Study Area

A systematic study of the northern slopes of the Kuraminsky Range began in 1925-26 when S.F. Mashkovtsev carried out a geological survey at a scale of 1:420000. Mashkovtsev published the first data on the results of the work. In 1935 he completed a report on a ten verst shooting, which by that time had covered the entire area of the eastern part of the Tashkent sheet. Geological and prospecting works on a scale of 1:200000, carried out in 1927-29, B.N. Nasledov clarified the details of the geological structure and ore content of the northern Karamazar [6].

From 1964 to 1970, within the limits of the Almalyk ore region, under the direction of I.F. Gaidamak and Yu.S. Shmanko, gravimetric surveys were carried out at scales of 1:50000 and 1:100000. In 1975, A.A. Kulakov and V.V. Neverov carried out generalizations on the study of geology, structure, and conditions for the placement of minerals in the Almalyk region. Promising areas for copper, polymetals, and gold have been identified [2]. In 1975, E.D. Molchanov carried out prospecting and exploration work with an assessment of the prospects for the Kyrkkyz, Yangokly ore occurrences. 11 wells were drilled, and one adit was passed. The predicted resources at the Kyrkkyz ore occurrence have been calculated [2].

In the Almalyk region, the processes of post-magmatic alteration of rocks manifested themselves with exceptional intensity and diversity. The complete material on their study was collected by Musin R.A., Zakirov T.Z., Viktorov V.F. on the Almalyk and Saukbulak ore fields; Moiseeva M.I. - on the Shenibek ore field and in the eastern part of the region, Zavyalov G.E. - in the interfluve Urgaz-Kandyr. As a result of performing special work in compiling a predictive map of the Almalyk region for copper and lead at a scale of 1:25000 (1963), the first summary map of hydrothermally altered rocks in the Almalyk region (Kulakov A.A.) was compiled, which, together with other maps, served as the basis for compiling a metallogenic map.

MATERIALS AND METHODS

In the implementation of scientific work, using traditional geochemical methods, determining the material composition of samples by various analytical methods (spectral analysis, mass spectrometer ICP-MS), using the results of field and laboratory work, geological maps were created using ArcGIS software.

RESULTS AND DISCUSSION

The distribution of copper in the sedimentary rocks of the Chatkal-Kurama mountains is discussed in the works of V.I. Rekharsky (1965), D.M. Surgutanova, M.D. Troyanov (1966), L.M. and others [2]. Ores of Kalmakyr, Dalnee (Yoshlik), Karabulak, Northwestern Balikty deposits of disseminated, vein-disseminated and vein type contain Cu (0.4%), Mo (0.005%), Au (0.59 g/t), Ag (2.6 g/t), which are concentrated in chalcopyrite, molybdenite, pyrite. In terms of reserves, the Almalyk deposits are super-giant and unique. Of particular industrial importance are rhenium (3016 g/t), osmium – 187 (4.6 g/t), and selenium (2016 g/t) in molybdenites. Researchers of porphyry copper deposits of the Almalyk mining region seem to have a commonality in their geological structure, tectonics, magmatism, material composition, and genesis of industrial mineralization.

Attention is drawn to the elevated contents of nickel (180 ppm) and cobalt (565 ppm) in pyrites, as well as the presence of platinum and palladium in sulfide minerals [1]. With a decrease in the thickness of the granite layer of the Chatkal-Kurama block from north to south, in the same direction, the lithophilic metallogenic specialization of the Chatkal subzone (Li, Be, W, U, Bi, Sn, TR) changes to chalcophile in the Kurama subzone (Cu, Pb, Zn, Au, Ag, Tl).

The main ore objects are located in the Kurama subzone. They are represented by porphyry copper and lead-zinc deposits of the Almalyk group and near surface gold-silver deposits in volcanic rocks [4].

Their spatial combination forms complex clarkes ominous plutonogenic (intrusive) ore magmatic systems of various facies (depths).

	Ba	Be	V	Bi	W	Ga	Ge	Co	Mn	Cu	Mo	As	Ni	Sn	Pb	Ag	Sb	Ti	Cr	Zn	Au	Nb	Li
Ba	1	-0,056	-0,161	0,088	-0,103	-0,232	-0,083	-0,040	0,378	0,091	0,236	-0,072	-0,049	-0,070	-0,068	-0,013	-0,054	-0,051	-0,132	-0,181	-0,036	-0,124	0,053
Be	-0,056	1	-0,104	0,112	0,771	-0,163	-0,075	0,402	0,096	0,344	0,166	0,097	0,991	-0,044	-0,044	0,010	-0,004	-0,073	-0,070	0,590	-0,022	-0,135	0,312
V	-0,161	-0,104	1	-0,193	0,029	0,641	0,381	0,169	0,048	-0,269	0,068	-0,261	-0,136	0,212	0,116	-0,092	-0,185	0,607	0,136	0,366	-0,106	0,084	-0,004
Bi	0,088	0,112	-0,193	1	0,194	-0,229	-0,039	0,133	-0,075	0,319	0,132	0,005	0,092	-0,034	0,149	0,397	0,122	-0,224	-0,035	-0,066	-0,012	-0,058	0,116
W	-0,103	0,771	0,029	0,194	1	0,075	-0,055	0,486	0,013	0,318	0,213	0,091	0,746	0,232	0,011	0,049	0,028	0,053	-0,172	0,472	-0,048	-0,023	0,292
Ga	-0,232	-0,163	0,641	-0,229	0,075	1	0,326	0,152	0,008	-0,249	0,135	-0,162	-0,171	0,521	0,226	-0,041	-0,218	0,361	-0,023	0,314	-0,117	0,109	-0,041
Ge	-0,083	-0,075	0,381	-0,039	-0,055	0,326	1	0,051	-0,163	-0,010	-0,049	0,004	-0,100	0,040	0,250	-0,052	0,296	0,165	0,338	0,410	-0,100	0,339	0,176
Co	-0,040	0,402	0,169	0,133	0,486	0,152	0,051	1	0,128	0,440	0,425	0,251	0,313	0,041	-0,095	0,223	0,015	0,277	-0,046	0,398	-0,092	-0,150	0,218
Mn	0,378	0,096	0,048	-0,075	0,013	0,008	-0,163	0,128	1	-0,098	0,140	-0,177	0,108	0,006	0,009	-0,077	-0,114	0,254	0,043	0,034	-0,091	-0,379	-0,010
Cu	0,091	0,344	-0,269	0,319	0,318	-0,249	-0,010	0,440	-0,098	1	0,069	0,449	0,287	-0,119	0,289	0,466	0,047	-0,117	-0,098	0,251	-0,015	-0,015	0,126
Mo	0,236	0,166	0,068	0,132	0,213	0,135	-0,049	0,425	0,140	0,069	1	0,156	0,154	0,232	0,044	-0,048	-0,111	0,051	-0,216	0,117	0,060	-0,129	0,272
As	-0,072	0,097	-0,261	0,005	0,091	-0,162	0,004	0,251	-0,177	0,449	0,156	1	0,073	-0,087	0,361	0,072	-0,035	-0,134	-0,243	0,067	0,188	0,176	0,058
Ni	-0,049	0,991	-0,136	0,092	0,746	-0,171	-0,100	0,313	0,108	0,287	0,154	0,073	1	-0,035	-0,043	-0,032	-0,023	-0,128	-0,080	0,572	-0,012	-0,141	0,283
Sn	-0,070	-0,044	0,212	-0,034	0,232	0,521	0,040	0,041	0,006	-0,119	0,232	-0,087	-0,035	1	0,091	-0,006	-0,068	0,079	-0,044	0,085	-0,035	0,130	0,091
Pb	-0,068	-0,044	0,116	0,149	0,011	0,226	0,250	-0,095	0,009	0,289	0,044	0,361	-0,043	0,091	1	0,087	-0,027	-0,040	-0,057	0,369	0,042	0,134	0,126
Ag	-0,013	0,010	-0,092	0,397	0,049	-0,041	-0,052	0,223	-0,077	0,466	-0,048	0,072	-0,032	-0,006	0,087	1	-0,033	-0,038	0,131	-0,023	-0,021	0,006	-0,063
Sb	-0,054	-0,004	-0,185	0,122	0,028	-0,218	0,296	0,015	-0,114	0,047	-0,111	-0,035	-0,023	-0,068	-0,027	-0,033	1	-0,114	0,396	-0,037	-0,023	0,191	0,256
Ti	-0,051	-0,073	0,607	-0,224	0,053	0,361	0,165	0,277	0,254	-0,117	0,051	-0,134	-0,128	0,079	-0,040	-0,038	-0,114	1	0,120	0,165	-0,075	0,075	-0,079
Cr	-0,132	-0,070	0,136	-0,035	-0,172	-0,023	0,338	-0,046	0,043	-0,098	-0,216	-0,243	-0,080	-0,044	-0,057	0,131	0,396	0,120	1	0,148	-0,080	-0,059	0,206
Zn	-0,181	0,590	0,366	-0,066	0,472	0,314	0,410	0,398	0,034	0,251	0,117	0,067	0,572	0,085	0,369	-0,023	-0,037	0,165	0,148	1	-0,103	0,059	0,354
Au	-0,036	-0,022	-0,106	-0,012	-0,048	-0,117	-0,100	-0,092	-0,091	-0,015	0,060	0,188	-0,012	-0,035	0,042	-0,021	-0,023	-0,075	-0,080	-0,103	1	0,118	-0,061
Nb	-0,124	-0,135	0,084	-0,058	-0,023	0,109	0,339	-0,150	-0,379	-0,015	-0,129	0,176	-0,141	0,130	0,134	0,006	0,191	0,075	-0,059	0,059	0,118	1	0,223
Li	0,053	0,312	-0,004	0,116	0,292	-0,041	0,176	0,218	-0,010	0,126	0,272	0,058	0,283	0,091	0,126	-0,063	0,256	-0,079	0,206	0,354	-0,061	0,223	1

Figure 2. Correlation of elements in the granodiorite rock in the Shaugaz-Kandir range

Correlation of copper element in granodiorite. When calculating the correlation of the elements in the granodiorite rock in the Shaugaz-Kandir range, it was found that the copper element has a good correlation with >3 Cu-Ag-As-Co-Be; >2 Weak correlation with Cu-Bi-W-Ni-Pb-Zn elements was found; A negative correlation with Cu-V-Ga-Sn-Ti-Cr elements was found (Figure 3).

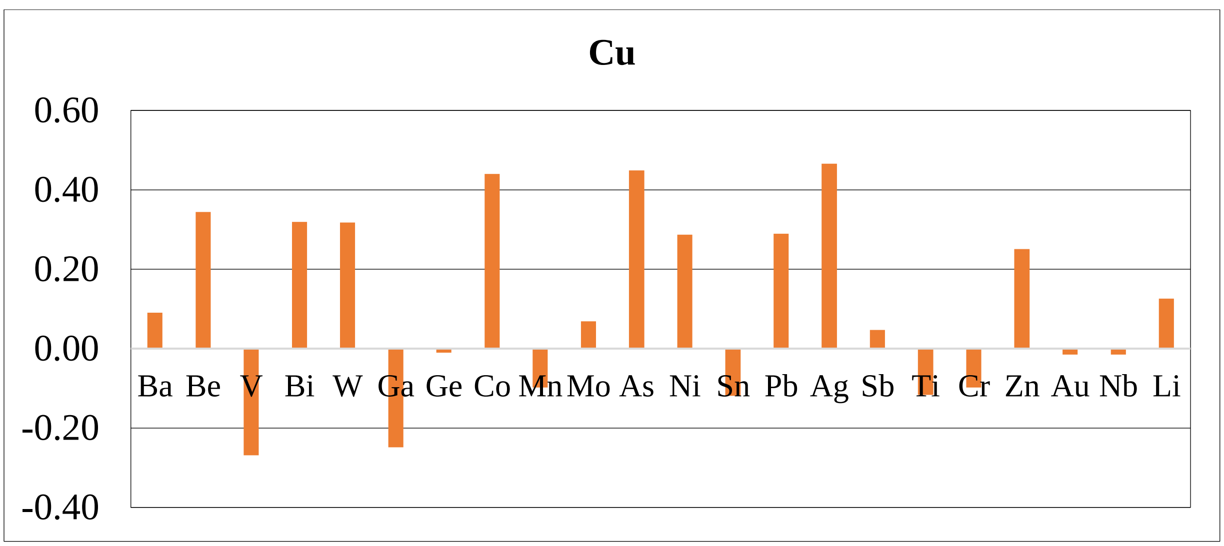

Figure 3. Correlation of elements in the granodiorite rock in the Shaugaz-Kandir range.

Correlation of molybdenum element in granodiorite. When calculating the correlation of elements in the granodiorite rock in the Shaugaz-Kandir range, it was found that the molybdenum element has a good correlation with >4 Mo-Co; molybdenum element >2 was found to be weakly correlated with Mo-Li-Ba-Sn-W elements; A negative correlation with Mo-Cr-Nb-Sb-Ag-Ge elements was found (Figure 4).

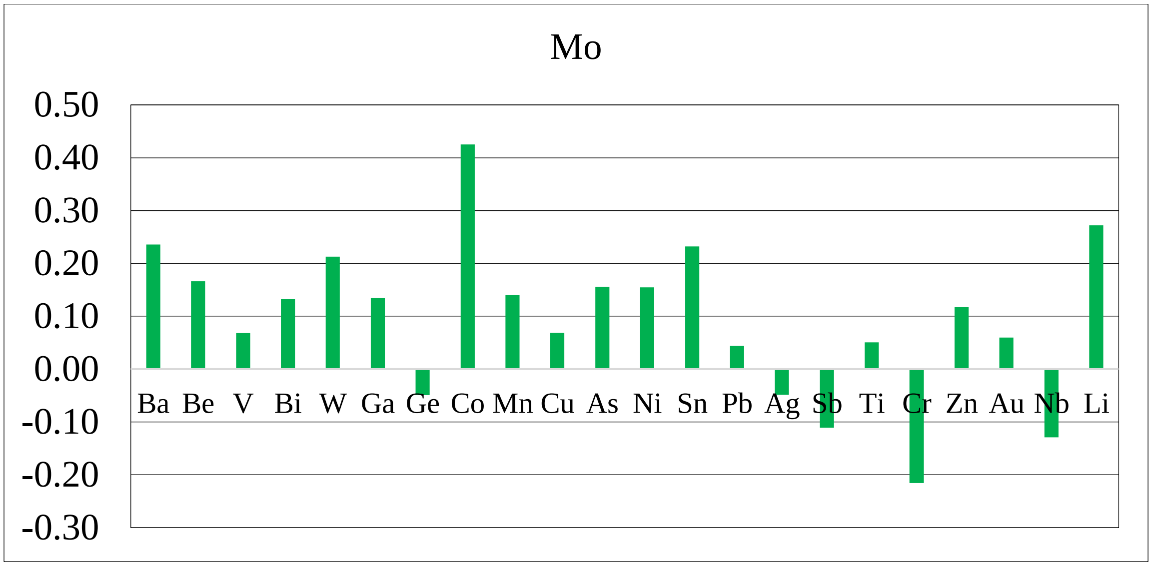

Figure 4. Correlation of elements in the granodiorite rock in the Shaugaz-Kandir range.

Correlation of zinc element in granodiorite. When calculating the correlation of the elements in the granodiorite rock in the Shaugaz-Kandir range, it was found that the zinc element has a good correlation with >4 Zn-Be-Ni-W-Ge; zinc element >2 weak correlation with Zn-Co-Pb-V-Li-Ga-Cu elements was found; It was found that the zinc element has a negative correlation with the Zn-Ba-Au elements (Figure 5).

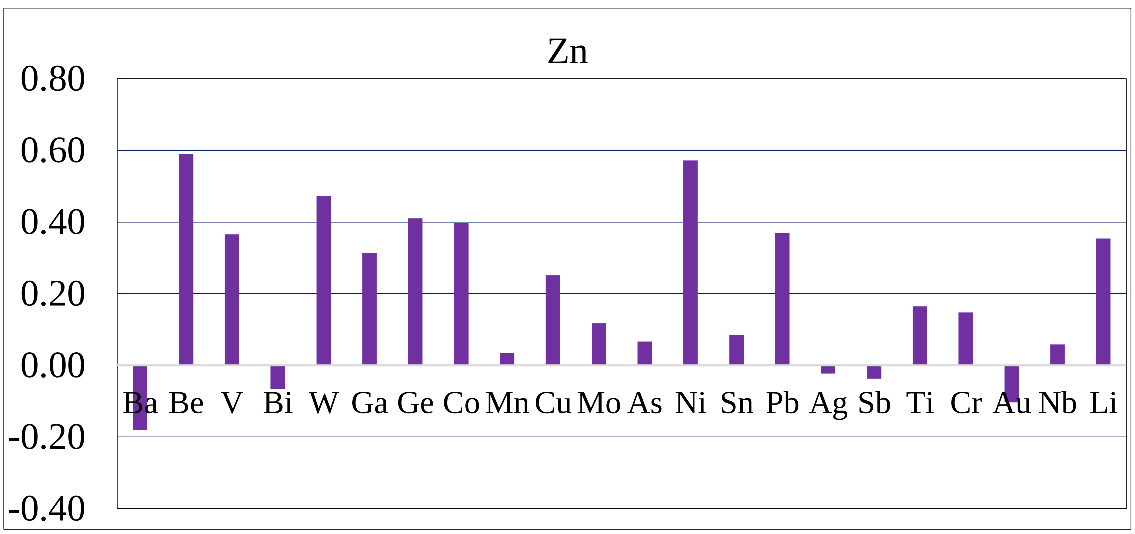

Figure 5. Correlation of elements in the granodiorite rock in the Shaugaz-Kandir range.

Correlation of tungsten element in granodiorite. When the correlation of elements in the granodiorite rock in the Shaugaz-Kandir range was calculated, it was found that tungsten element is well correlated with >4 W-Be-Ni-Co-Zn; It was found that tungsten element >2 has a weak correlation with W-Cu-Li-Sn-Mo elements; It was found that tungsten element has a negative correlation with W-Ba-Cr elements (Figure 6).

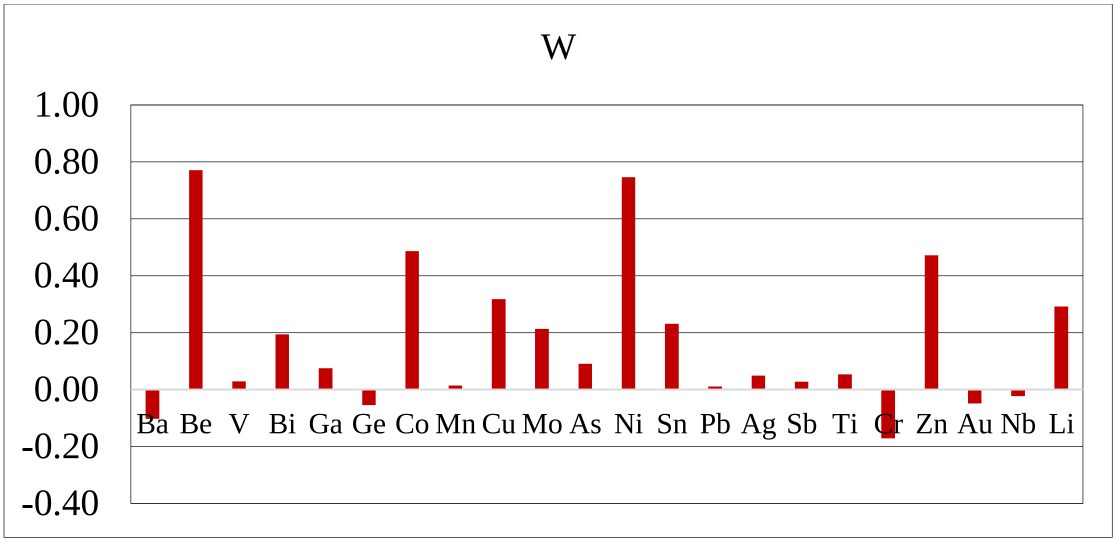

Figure 6. Correlation of elements in the granodiorite rock in the Shaugaz-Kandir range.

Correlation of cobalt element in granodiorite. When calculating the correlation of the elements in the granodiorite rock in the Shaugaz-Kandir range, it was found that the cobalt element has a good correlation with >4 Co-W-Cu-Mo; cobalt element weak correlation with >2 Co-Be-Zn-Ni-Ti-As-Ag-Li elements was found; A negative correlation was found with Co-Nb-Pb-Au-Ba elements (Figure 7).

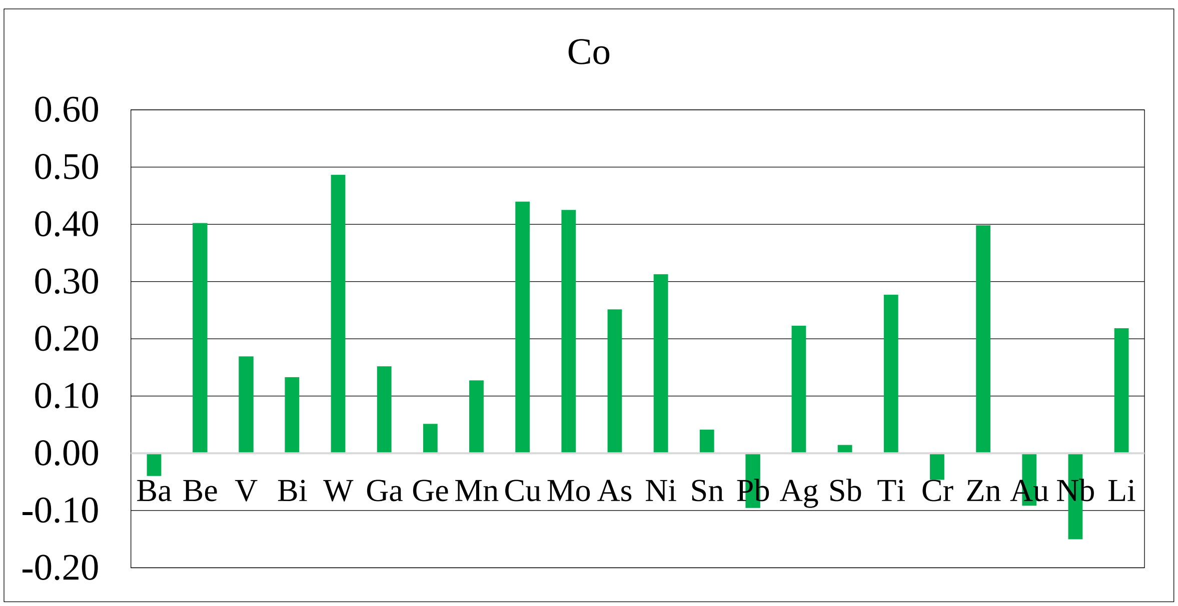

Figure 7. Correlation of elements in the granodiorite rock in the Shaugaz-Kandir range.

Conclusion

The correlation of elements in the granodiorite rock in the Shaugaz-Kandir range was calculated. It was found that Cu, Zn, W, Co, Mo have a good correlation with the main elements. It indicates the presence of chalcopyrite, sphalerite, molybdenite minerals in the area.

REFERENCES

Abror Abdullaev, Kholmurod Khaliyorov, Sunnat Shanazarov, Paraxat Ziyayeva, Ilkhom Ruziyev, and Mahmud Muminov (2023). Ore-containing data of Lyalyagun mineralized zone of Malguzar mountains" E3S Web of Conf. Volume **401,** V *International Scientific Conference "Construction Mechanics, Hydraulics and Water Resources Engineering" (CONMECHYDRO - 2023)*

Akhundjanov R., Karimova F.B., Jumaniyazov D.I (2021). Ore-bearing monzonitoids of the Yoshlik (Far) copper-molybdenum deposit, Almalyk region (Republic of Uzbekistan). *Geology and Mineral Resources*. №3. 43-48.

Akromiddin Umarov, Anvar Shukurov, Alisher Djurabayev, Mansur Ruziev, Ilkhom Ruziev, and Satbay Nurjanov (2023). Minerals of bismuth and antimony in original deposits of Zarmitan gold zone, located in granitoid intrusion (Uzbekistan)" E3S Web of Conf. Volume **401,** V *International Scientific Conference "Construction Mechanics, Hydraulics and Water Resources Engineering" (CONMECHYDRO - 2023)*

Badalov S.T., Golovanov I.M., Dunin-Barkovskaya E.A. (1971). Geochemical features of ore forming elements of the Chatkal-Kurama mountains. Tashkent: "FAN". 227

Khalilov A.O (2016). Prospects for the complex gold-copper-porphyry mineralization of the eastern part of the Almalyk ore region // Integration of science and practice as a mechanism for the effective development of the geological industry of the Republic of Uzbekistan / *Proceedings of the International Scientific and Technical Conference. T.: "IMR" GP. Part I.* -C 351

Khaliyorov Kh, Khoshzhanova K, Atabaeva N, Karamatova G, Ruziev I and Nurzhanov S (2023). Distribution of copper in intermediate rocks of the Shaugaz-Kandyrsay interfluve (Eastern Almalyk). E3S Web of Conf. Volume **401,** V International Scientific Conference "Construction Mechanics, Hydraulics and Water Resources Engineering" (CONMECHYDRO - 2023)

Khaliyorov Kh. Khoshzhanova K. Ruziev M (2022). Distribution of chemical elements in igneous and Metasomatic rocks of the Almalyk ore field (between Shaugaz and Kandyr say). *International scientific journal «Global science and innovations 2022: Central Asia» Nur-Sultan, Kazakhstan, April* C 21-24

Khaliyorov Kh. Khoshzhanova K. Ruziev M (2022). Distribution of chemical elements in igneous and Metasomatic rocks of the Almalyk ore field (between Shaugaz and Kandyr say). *International scientific journal «Global science and innovations 2022: Central Asia» Nur-Sultan, Kazakhstan*, April C 21-24

Khaliyorov Kh. Khoshzhanova K. Ruziev M (2022). Petrochemical composition of metasomatites in the Shaugaz-Kandyr area of the Almalyk ore field // UzMU Khabarlari, №1 C 296-298

Khaliyorov Kh. Khoshzhanova K. Ruziev M (2022). Petrochemical composition of metasomatites in the shaugaz-kandyr area of the Almalyk ore field. *UzMU Khabarlari №1 C* 296-298.

Kremnev I.G., Dombrovsky O.V., Khaydarov B.Kh (2020). Geological-structural and metallogenic features of the Chatkal-Kurama ore province. *Integration of science and practice as a mechanism for the effective development of the geological industry of the Republic of Uzbekistan. Proceedings of the International Conference.*

Zvezdov V.S., Migachev I.F., Minina O.V. (2018). Morphological types of porphyry copper stockworks and conditions of their formation. *Ores and metals*. **4**. S. 37-52**.**