

GEOLOGICAL STRUCTURE OF QUARTZ SANDS OF CENTRAL KYZYLKUM (BASED ON THE EXAMPLE OF OMAD-V DEPOSIT)

A. U. Mirzayev, *U. Kh. Nazarov

*Navoi branch of the Academy of Sciences of the Republic of Uzbekistan, Navoiy city, Uzbekistan,
Author for Correspondence: nazarovuzruh@gmail.com

ABSTRACT

The article provides information about the geological structure of the quartz sands of the Omad- V deposit in Central Kyzylkum, an overview map, as well as a geological map, in addition to the results of the chemical composition of the quartz sands of the Omad-V site.

Keywords: *Quartz Sand, Period, Geological Map, Clay, Thickness, Chemical Analysis*

INTRODUCTION

Non-metallic minerals represent a vast group of rocks and minerals that serve as essential raw materials for industry, agriculture, and construction. They are widely distributed, and the number of their deposits in the Republic of Uzbekistan is counted in the thousands. The range of applications for non-metallic minerals is broad and diverse; some of them are considered strategic raw materials (such as kaolin and quartz sands). The main industries that use quartz sands are the foundry industry (approximately 76% of all extracted quartz sands) and the glass industry (18%). They are also used in the production of faience, dinas refractories, silicon carbide, and abrasive materials. In foundry production, sands are used as the primary (85–95%) component of molding and core mixtures. (Khamidov et al., 2011)

In Uzbekistan, more than two dozen occurrences and areas of quartz sand have been identified, several of which are considered promising, mainly associated with Paleogene deposits. Currently, the Mayskoye deposit is being developed as raw material for glass production, while the Dzheroy and Karmaninskoye deposits are being exploited as construction sand. In addition, deposits of quartz-feldspar raw materials are also known in Uzbekistan, including the Kamyshbashin and Azatbash deposits, among others. Administratively, the deposits and prospective occurrences of quartz sands are located in the Navoi, Kashkadarya, Tashkent, and Fergana regions. Special emphasis is placed on the prospective deposits located in the Central Kyzylkum region, including Akmur, Kulatay, Aidarli, and the Omad-V site. (Zakirov et al., 1983)

In terms of geographical distribution, the most favorable area for the concentration of high-quality quartz sand is the Central Kyzylkum region, where nearly monomineralic quartz sand varieties are associated with the "Lyavlyakan Horizon" of the Upper Eocene.

The Omad-5 quartz sand site is located in the Tamdyn District of the Navoi Region, 56.0 km northeast of the city of Zarafshan and 41 km northwest of the district center, Tamdybulak. It is connected to Tamdybulak by roads with gravel and asphalt surfaces that are operational year-round. The nearest railway station, Kizil-Kuduk, is situated 122 km southwest of the site.

The geological exploration site is located in the Central Kyzylkum region, which is a desert area characterized by low mountain ranges and depressions. The northern part of the described area is occupied by the Bukantau Mountains and their spurs, with the highest elevation reaching 764 meters. The lowest point of the territory, at 16 meters, is located in the southwestern part of the Minbulak Depression. The mountain slopes are steep and dissected by numerous transverse ravines (sais).

The rest of the area consists of a semi-desert foothill plain, cut by gullies, wide hollows, dry streambeds, and small hills. The relative elevation difference between watershed areas and the bottoms of ravines, as

Research Article

well as between hills and the plain, ranges from 20 to 40 meters, occasionally reaching up to 90 meters. The general slope of the terrain in the area is towards the southwest. The absolute elevations of the surface at the site range from +192 m to +220 m, with the terrain gradually descending from the northwest to the southeast (Rubanov *et al.*, 1962).

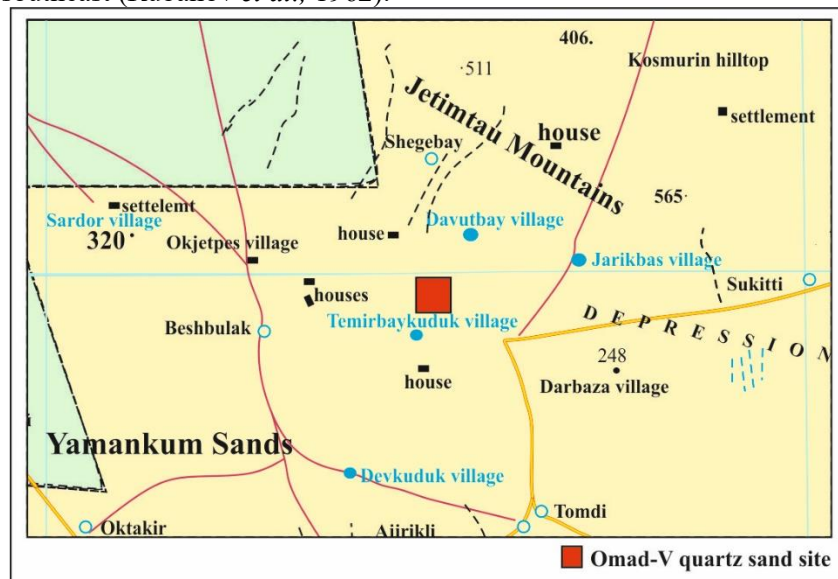


Figure 1: Overview map of the project area, scale 1:1.000.000

MATERIALS AND METHODS

The site is located in the eastern part of Central Asia and was formed within the arc of the same name. It borders the Syrdarya Syncline to the east and northeast, and the Amudarya Syncline to the west and southwest. Geologically, the region consists of platform strata from the Proterozoic and Paleozoic eras, as well as covers from the Meso-Cenozoic era.

Omada-V quartz sand site mainly consists of deposits from the Paleogene and Quaternary periods. During the Paleogene period, green-colored clay layers and quartz sands were formed, while in the Quaternary period, loess-like sediments and dune sands developed.

Paleogene period (Eocene, Pg2). In the geological section of the area, mainly Eocene deposits are encountered. They appear at the surface in some places and are also recorded in mine workings.

In the lower layers, there is a light green, flexible clay that crumbles like fat when handled. When dried, it takes on a gray color and forms fine cracks. Sometimes, thin horizontal layering is noticeable. In the southern parts of the area, the exposure of these clays is observed.

Above, the clay layers alternate with sand. In the sand-clay contact zones, the clay content in the sand gradually increases, transitioning slowly into pure quartz sands. In some places, clay lenses are observed. The white and light yellow quartz sands are well sorted and mainly consist of fine grains. They are widely distributed in the northern and southern parts of the area. The light yellow varieties are mostly limited to the central region. The thickness of the sand layers ranges from 1.9 to 14.1 meters and they lie dipping southeast at an angle of 1–4°.

Neogene period. Within the area, Neogene deposits have not been identified; however, in the outer regions, they have been recorded as consisting of brown-red clays and sandstones.

Quaternary period. Paleogene rocks are overlain by modern Quaternary deposits. These consist of dune sands and loess-like sediments. The dune sands are rich in feldspar and mica and have a reddish-gray color. The loess-like sediments contain quartz and carbonate-silica fragments up to 1 cm in size, as well as gypsum fragments. Their thickness varies from 0.3 meters in the north to 6.9 meters in the northwest.

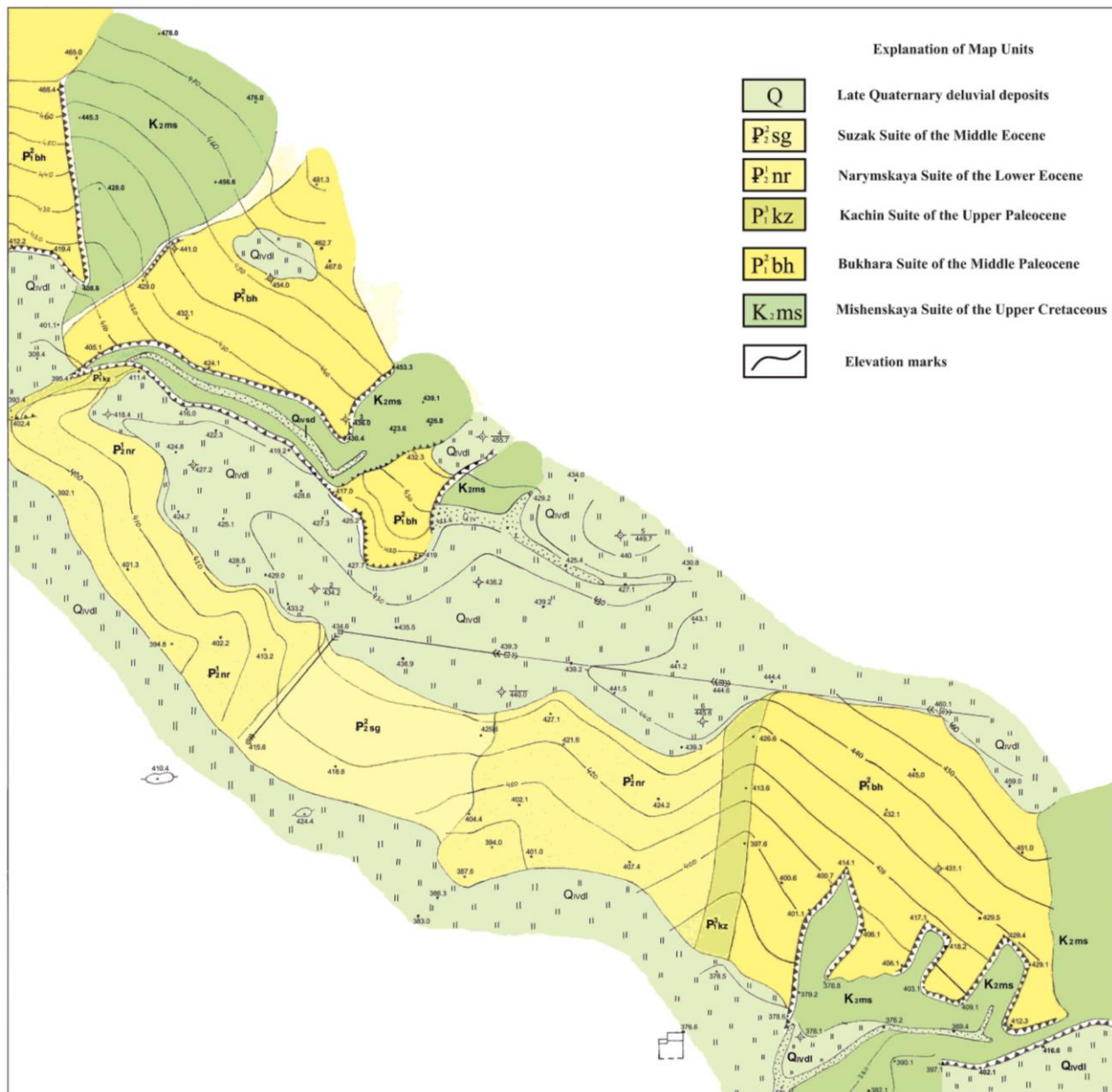


Figure 2: Geological map of the Omad-V site

Properties of quartz sands

Quartz sands are whitish-gray or white in color and mainly consist of fine fractions. They occur in a loose, weakly cemented, and partially compacted state. The grains are often rounded, transparent, and clean, with some showing iron hydroxide coatings or microinclusions. The main mineral in the sands is quartz, which predominates in all fractions and is sometimes enriched with rutile needles. Calcite is observed as separate grains.

The content of fine fractions (smaller than 0.1 mm) ranges from 0.2% to 15%, increasing up to 20–23% in some areas. The uneven distribution of these values leads to variations in sand quality. The coefficient of variation in sand layer thickness is 20% in erosion-free zones and reaches 45.2% in the eroded southeastern part, indicating a relatively stable sand layer.

Research Article

Genetically, the quartz sands in the Omad-V area are sedimentary rocks formed during the Upper Eocene to Lower Oligocene period in a shallow marine environment under the influence of wave action. These sands are the main mineral resource of the deposit and possess high economic value. (Karzhauv et al., 1966)

RESULTS AND DISCUSSION

The initial chemical analysis of quartz sand samples was conducted in the chemical analytical laboratory of the “IMR” SI. The results of the chemical analysis of the studied samples are presented in Table 1.

Table 1: The chemical analysis results of the Omad-V site

№	Sample	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	o.i.
1	1st-technical sample	90.24	1.78	0.57	1.85	0.42	0.02	1.31
2	2nd- technical sample	91.36	1.74	0.26	1.79	0.57	0.01	2.66
3	3rd- technical sample	90.84	2.56	0.47	1.96	0.36	0.02	1.75

In addition, for comparison purposes, preliminary samples of quartz sand from the Djeroy-IV section of the Djeroy deposit were chemically analyzed. The results of the chemical analysis of the studied samples are presented in Table 2.

Table 2: The chemical analysis results of the Djeroy-IV section

№	Sample	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	o.i.
1	1st-technical sample	94.39	0.63	0.11	1.59	1.36	0.06	1.12
2	2nd- technical sample	97.41	0.94	0.09	1.76	0.47	0.09	1.53
3	3rd- technical sample	96.17	0.40	0.15	1.98	1.32	0.05	2.36

Based on the chemical analysis results presented in the tables, the average values of the two sites were compared in Diagram 1.

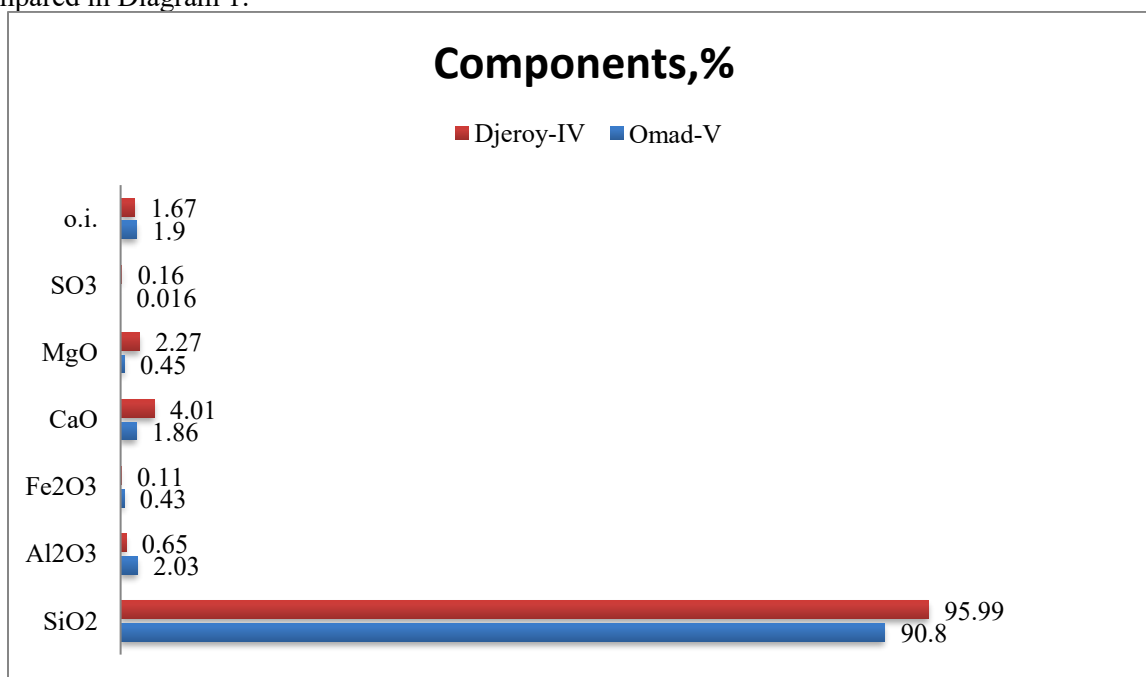


Figure 3: Diagram of the average chemical composition values of quartz sands from the Omad-V and Djeroy-IV sites.

Research Article

Conclusion

Thus, according to the chemical analysis data and their comparison, it can be concluded that the quartz sands of the Djeroy-IV site contain a higher amount of SiO₂ than those of the Omad-V site. However, the sands from Omad-V can be used in various industries, including construction (for the production of decorative plasters and fine-grained concrete), as well as in the manufacture of paints and enamel. Nevertheless, given the strict requirements in glass production, the sands from both sites must undergo beneficiation.

REFERENCES

- Karzhaev TK, Ibaydullaev N (1966).** Quartz Sands of the Meso-Cenozoic Formations of Central Kyzylkum and Some Questions Regarding Their Formation Conditions. In the book: *"Lithology and Sedimentary Mineral Resources of Uzbekistan"*. Tashkent.
- Khamidov RA, Ergashev AM, Khodjaev NT, Khakberdiev NM (2011).** Non-metallic Mineral Resources of Uzbekistan / State Committee of the Republic of Uzbekistan for Geology and Mineral Resources. "Institute of Mineral Resources". Tashkent: State Enterprise "IMR". p.13.
- Platias S, KI Vatalis, G Charalampides (2014).** Suitability of Quartz Sands for Different Industrial Applications – International Conference on Applied Economics (ICOAE) 2014. *Procedia Economics and Finance*. **14** 491–498.
- Rubanov IV, Gafurdzhanov SG (1962).** New Sand Deposits in Uzbekistan Reports of the Academy of Sciences of the Uzbek SSR. No. **5**.
- Zakirov MZ, Gafurdzhanov SG (1980).** Quartz-Feldspar Sand Deposits of Uzbekistan and Prospects for Their Utilization. *"Uzbek Geological Journal"*. No. **1**
- Zakirov MZ, Gafurdzhanov SG (1983).** Quartz and Quartz-Feldspar Sands of Uzbekistan. Tashkent: Publishing House "Fan" of the Uzbek SSR..