

GEOLOGICAL CHARACTERISTIC OF “STARITE KOLIBI” MARBLE DEPOSIT IN ASENOVGRAD DISTRICT

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ABSTRACT

The “Starite kolibi” deposit is located near to Muldava village and Asenovgrad town. The district is presented by the marbles of the Dobrostan Marble Branch. The region belongs to the Central Rhodope block and northwest edge of the East Rhodope Paleogene decline. They are massive marbles without sloping surfaces, with irregular cracks with different directions and slopes. They form a marble arc-shaped strip with a maximum length of 1050m and a maximum width of 330m. The thickness of the marbles is 39,4m. The top layer is made of a clay-sandy layer with small marble pieces and soil and average thickness of 0,4m. The origin of the marbles from the “Starite kolibi” deposit refers to the group of metamorphic deposits. The marbles in the whole career are visually all the same and massive with no cracks and stratifications. The main colors are gray-white and white. From the petrography point of view, they are fine crystalline and semi-crystalline marbles and the crystalline crystals are partially recrystallized. Calcite is the major rock-forming mineral (97-98%) of the marbles in the deposit.

Keywords: Marbles, Petrography, Metamorphic deposits.

INTRODUCTION

According to Kozhuharov the "Starite kolibi" deposit is made up of marbles of the Dobrostan marble complex, covered with a thin clay-sandy layer with small marble parts and soil. They are massive marbles without sloping surfaces, with irregular cracks with different directions and slopes. Around the area of the study, there is information from several boreholes, according to which the following rocks are observed: sandstones, clays, marble. Marbles in the area are transformed limestone and dolomite limestone under the conditions of regional metamorphism [1]. The deposit has an area of 231 635m². The development will be done by an opencast method. According to the mining and technical conditions of the deposit a multi-stage system of development was adopted. Each horizon is developed by sequentially taking the lamellas of which it is divided. Exploitation takes place first in the uppermost horizon. At the end of the mining on the current horizon goes to the next one, so that if it is necessary to increase the annual yield it is possible to work simultaneously on two operating horizons. A classical "top-down" development system using blasting operations to separate the marble from the rocks. The explosive material is used only to isolate the marble from blocks.

The annual mining of a solid mining mass is considered to be 240000 tons per year. The volume of the material which has to be removed is 41500 m³ and its average thickness is 0,4m. The average thickness of the useful material is 39,5m [2].

GEOLOGICAL - GEOGRAPHICAL FEATURE

The area of interest is situated on the 1270m southern of Muldava village and around 4km southeast from Asenovgrad. On the picture below is shown “Starite klibi” deposit.



Figure 1. “Starite kolibi” deposit

The access to the quarry is carried out by a deviation from the village of Muldava on an existing road with crushed stone pavement. Topographic map on figure 2 shows the exact position of the “Starite kolibi” deposit. The locality is about 375 meters away from the Asenovgrad - Kardzhali road.

On the figure 2 is obvious how close to the road is the deposit, which has high importance to the transportation purposes.



Figure 2. Topographic map on the district

To the east of the deposit, over the marbles of the Dobrostan congregations are located Paleogene marble conglomerates and breccia conglomerate. They are terrigenous coarse sediments. Small to large rounded, semi-rounded, rarely edged pieces. The bond is limestone to limestone - sandy, pigmented by iron hydroxides, giving reddish colour to the sediments. To the north and east of the marbles are situated the diluvial deposits of the Quaternary. They are reddish clay, mainly marble, different in colour and size.

GEOLOGICAL CHARACTERISTIC OF DEPOSIT AND CLASSIFICATION OF RESOURCES

The geological exploration of the area is good. The Rhodope Massif extends in southern Bulgaria and northern Greece consists of high grade metamorphic rocks, including granitic gneisses, marbles, and amphibolites [3]. The whole area was covered with geological mapping in M 1: 100000 and M 1: 25000 during the period 1951 – 1968 [4]. The general revision of the Chepelare map of the last geological map M 1: 100000 and the explanatory note is made by Kozhuharov in 1994 [5]. The stratigraphic scale of the Rhodope metamorphic basement [6] used in the Geological Map of Bulgaria M 1:100 000, represents a real superposition of lithostratigraphic units without pretending to correspond completely to the primary one [7].

The deposit includes a marble arc-shaped strip. In the central part of the strip, the marbles are revealed in wells and small old quarries. According to schematic geological mapping on the quarry boards' marbles are revealed on the surface or are covered with a thin clay-sandy layer with small marble chips and soil.

Marbles are affected by the processes of erosion, mainly in the surface areas of the marble massif and around the tectonic (few and rare) disorders. Small karsts form up to 2 cm are observed: caverns and pores.

According to petrography marbles are fine crystalline and semi-crystalline marbles and the crystalline crystals are partially recrystallized. Calcite is the major rock-forming mineral (97-98%) of the marbles in the deposit. It forms isometric or slightly elongated to the foliation xenoblasts with varying size and irregular grain boundaries [8]. Marbles are massive marbles without sloping surfaces, partly cracked, with crystalline calcites often seen on the cracks. In single sections, layers of thin-to-medium-sized marbles (0.5 to 2 m) or thin-layer marbles are observed on the boards. In the south eastern flank of the marbles there are also layers of mica shale.

The marbles are grey, white, greyish, creamy, rarely yellowish and greyish, in single occasions pale pink. The marbles in all workmanship are visually the same massive with no slimness. They are medium to large, crystalline and dense. The knowledge of the morphological characteristics of the ore bodies could improve the effectiveness of exploitation process [9]. Physical-mechanical index of the marble in "Starite kolibi" deposit is shown on Table №1 [10].

Table 1. Physical-mechanical index of the marble in "Starite kolibi" deposit

№ probe	Bulk density	Specific density	Pore volumе	Porosity coefficient	Water absorption	Compressive strength in dry state	Compressive strength in wet state
	g/cm ³	g/cm ³	%		%	X10 ⁵ Pa	X10 ⁵ Pa
1	2.73	2.77	1.44	0.015	0.66	577.1	397.3
2	2.78	2.84	2.11	0.022	0.46	709.6	531.5
3	2.68	2.72	1.47	0.015	0.31	458.2	362.5
4	2.68	2.71	1.11	0.011	0.15	438.6	413.2
5	2.67	2.71	1.48	0.015	0.13	565.6	503.2
	2.71	2.75	1.52	0.016	0.34	549.8	441.5

As it is shown on Table №1 the marble from "Starite kolibi" deposit has almost theoretical value of physical characteristics, which made it perfect for building purposes.

As a result of the detailed geological investigations carried out in the "Starite Kolibi" deposit - 11942700 m³ of marble for building materials were found and calculated. The classification of the reserves is shown on Table №2.

Table 2. Classification of the reserves

Classification of the resources	Volume of the material to be removed (thousand . m ³)	Volume of the resources (thousand . m ³)
[111]	6.7	1961.0
[122]	34.8	9981.7
Total [111]+[122]	41.5	11942.7
Total resources [332]	0	7374.4
The ratio of the amount of the material to be removed to the stock quantity is 1:288; Total usability 99%.		

CONCLUSION

Marble has a large variety of uses nowadays, because of its structure, hardness and its ability to get polished which made it one of the most ideal facing materials.

This metamorphic stone composed mostly of mineral calcite [CaCO₃] under extremely high pressure and intense heat beneath the Earth, results from the process of recrystallization of limestone. The effect of such process is of great importance, because the newly created stone bears very tight crystalline structure with very small porosity. All these features made it perfect for building material all over the world. Although marble quarrying is an energy intensive activity it is one of the most important necessities for building industry.

REFERENCES

- [1] Grigorova, M. and Koprev, I., Geophysical investigations in "Starite kolibi" marble deposit in central southern Bulgaria, International Scientific Conference GEOBALCANICA, under print.
- [2] Koprev, I., Report on the Geophysical Studies of the "Starite kolibi" deposit, 2018.
- [3] Rohrmeier, K., Quadt, A., Driesner, T., Heinrich, C., A., Handler, R., Ovtcharova, M., Ivanov, Z., Petrov, P., Sarov, St., Peytcheva, I., Post-Orogenic Extension and Hydrothermal Ore Formation: High-Precision Geochronology of the Central Rhodopian Metamorphic Core Complex (Bulgaria-Greece), *Economic Geology*, 108(4):691-718, 2013.
- [4] Ivanov, R. Stratigraphy and structure of the crystalline in the Eastern Rhodopes.-Tr. Geol. Bulg., ser. Geochim. i pol. izk., 2, 69-114, 1961 (in Bulg.).
- [5] Kozhouharov, D., I. Boyanov, A. Goranov, E. Kozhouharova. Geological map of Bulgaria at 1:100 000 scale, Krumovgrad and Sape map sheets, S., 1995.
- [6] Kozhoukharov, D., Precambrian in the Rhodope massif, Lithostratigraphy. — In: Zoubek, V., Cogne, J., Kozhoukharov, D., Krautner, H. (Eds.), *Precambrian in Younger Fold Belts*, 1988, J Wiley&Sons, 726—745.
- [7] Georgieva, M., Cherneva, Z., Hekimova, S., Petrova, A., Petrology of marbles from the Arda tectonic unit, Central Rhodope, Bulgaria, *GEOSCIENCES*, 2009.
- [8] Kozhoukharova, E., Reconstruction of the primary stratigraphy and correlation of the Precambrian metamorphic complexes in the Rhodope massif, 2007, 19-20.
- [9] Megaw P.M., Carbonate-hosted Pb-Zn-Ag-Cu-Au replacement deposits: An exploration perspective. In: Lentz DR (Editor) *Mineralized intrusion related skarn systems*, Mineralogical Association of Canada, Short Course Series, 26, 337-357.
- [10] Sharlopov, V., Ralcheva, R., Maleshkov, M., Valchanov, V., Valckova, Z., Chobanova, T., Jovcheva, I., Koleva, S. and Ilieva, N., Assessment of the impact on the environment of an investment proposal: "Development of quarry for marsh harvesting in the "Starite kolibi", Muldava village, Asenovgrad district, Plovdiv Municipality, 2018.