

МАКЕДОНСКО ГЕОЛОШКО ДРУШТВО

ТРЕТ КОНГРЕС

на

Геолозите на Република Македонија

ЗБОРНИК НА ТРУДОВИ

-КНИГА 2-



Уредници:

Лепиткова, С. & Боев, Б.

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PREBAIKAL FORMATION ON THE TERRITORY OF THE REPUBLIC OF MACEDONIA AS SIGNIFICANT BEARERS OF QUARTZ RAW MATERIALS

¹Krsto Blazev, ¹Gorgi Dimov, ¹Blagica Doneva, ¹Marjan Delipetrov

*Faculty of Natural and Technical Sciences, Institute of Geology, "Goce Delčev" University in Štip, Blvd. Goce Delčev 89, Štip, Republic of Macedonia,
krsto.blazev@ugd.edu.mk*

Abstract: Prebaikal formations on the territory of the Republic of Macedonia are the most important bearers of silicate materials such as the hydrothermal quartz wires with striking purity (SiO₂ 99%) and small presence of harmful minerals (limonite) as metamorphic quartzite and quartz sandstone.

Here are three separate formations as most notable bearers of these materials: Formation of gneisses and amphibolite with deposits of pegmatite, micashiste formation and the formation of Pelagonian granites.

This paper includes a description of mineral raw materials that occur in every formation, their exact location, mineralogical, and the structural and textural features and appearance. It also given a estimation of reserves for the silicate raw materials and their perspective for future research.

Keywords: Prebaikal formations, geological - mineralogical characteristics, hydrothermal quartz wires, metamorphic quartzite.

INTRODUCTION

The territory of the Republic of Macedonia in which construction participating lithophacial complexes and the various formations of different age (from Precambrian until today) is rich in silicate mineral raw materials. With the previous geological explorations has been registered significant number of occurrences of silicate raw materials. Depending on their geological - technological and the exploitation conditions large number of the them are detailed explored.

Almost all investigated silicate raw materials are monomineral quartz rock masses, that serve as the basis for development of the industrial branch called non-metallic mineral

raw materials of the Republic of Macedonia[2].

For the origin of silicate mineral raw materials are characteristic Prebaikal orogeny stage, majority of the Baikal and the modern (recent) Quarter stage. This paper presents in detail significant formations of prebaikal stage.

Prebaikal formations on the territory of the Republic of Macedonia appear as significant bearers of quartz raw materials[2]. We point out the following formations:

- Formation of gneisses and amphibolite with deposits of pegmatite
- Micashiste formation
- Formation of Pelagonian granites

1. FORMATION OF GNEISSES AND AMPHIBOLITE WITH DEPOSITS OF PEGMATITE

This formation is constructed by twomica gneisses (muscovite and thebiotite) amphibole gneisses, and the amphibolite and amphibole schist. On several sites, the formation of these highly metamorphic Precambrian rocks breach granite and the granodiorites that occur in the pegmatite and pegmatite wires.

This formation is developed in the Serbian - Macedonian massif and Struma zone, then in Pelagonian horst- anticlinorium and in the Vardar Zone occurs in isolated blocks that represent relicts by precambrian gneiss complexes analogous to by Serbian -

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Macedonian massif and Pelagonian horst - anticlinorium.

In Serbian - Macedonian massif and the Struma zone this formation is developed on several mountain massifs: Kozjak, Osogovo, Plachkovica, German, Malesevo mountains, Ograzden and Belasica. Mostly built by twomica gneisses which by their position and distribution can be considered as basic rocks of highly metamorphic complex of Serbian - Macedonian massif. That is fine to medium granular shistocks built mostly by quartz, feldspar, mica, epidote and garnet. The structure is lepidoblastic to granoblastic.

Amphibolite and amphibole shist are most represented on the mountains: German, Osogovo and Ograzden. That is dark green rocks with weak shist features composed by amphibole, feldspar and rarer quartz.

This formation on the territory of Serbian - Macedonian massif and the Strumskata zone is characterized as a bearer of silicate raw materials. Numerous occurrences of hydrothermal quartz wires and the pegmatite body have been found, in which are found mono mineral concentrations quartz in the form of wires and lens.

The hydrothermal quartz wires were the products of magmatic activity where we have deposition of monomineral quartz mass from the hot water solvents. Such small bearings are found of several places. The hydrothermal quartz wires are defined in the gneiss near the village Dvoriste (Berovo), Ribnica and the village Lukovica (Delchevo). In area between the Dvoriste and Visoka Maala in the gneisses is occur quartz - porfires mixed with aplite and pegmatite wires in which appear larger masses of pure quartz.

Occurrences of hydrothermal quartz wires are found east of Vinica with small pegmatite bodies in the twomica gneisses. In village Reljan (Kumanovo) are defined more quartz wires in the migmatite accompanied by

feldspar veins. All these quartz wires are with different sizes and often ranging from 0.5 to 5 m by width, while the length can be between 20 and 50 m. Always show good quality (SiO₂ over 99%) so that some of them are in phase of exploitation.

Gneisses and the amphiboles in Pelagonian are presented in the mountain massifs.

Jakupica Babuna, Mukos, Selecka and Nidze with Kajmakalan. In bottom

metamorphic complex are presented with gneisses, and mixed series from upper metamorphic complex.

Through these rocks in several places were discovered hydrothermal wires and lenses, build from quartz. Characteristic are the appearance of a number sites especially in the area of the mountain Rudina in the northeastern area of the village Brailovo in Bogomila and the Kapinovo. Quartz wires are commonly oriented east - west in length reaching 200 m and by widths up to 20m. Are mainly build from pure quartz and rarely contain feldspar and muscovite.

In this series occur significant deposits of pegmatite in which are found wires and lenses from pure quartz. Quartzs are wired differentiate from granodiorite magma in this massif. The quartz is with milky color and the excellent quality. The most important occurrences is of mountain Selecka (village Dunje), Kokre on Babuna and Mukos on the village Drenovci, Sovichi, Tepavci, Gnilezon Vitoliste and the Mariovo and famous deposits Orehovo, Oreshje, Ramnaniva, Beluce, Chanishte, Proluka and Paralovo.

As we mentioned formation at the Vardar zone occurs at isolated blocks that represent relicts from precambrian complexes analogous to Serbian - Macedonian massif and the Pelagonian horst. For these reasons it has the same features with above described formation [4].

2. MICASHISTE FORMATION

This formation is built from micashiste in which can meet the faces from leptonolite, quartzite and graphite schist. As the previous formation and this is developed on terrains of the Serbian - Macedonian massif, Struma

zone, Pelagonian horst-anticlinorium and Vardar zone.

Micashists have clearly expressed schistosity, siliceous gloss and silver color. The structure is lepidoblastic to granoblastic. Major minerals are quartz, muscovite and biotite.

In micashists frequently appears the facies from leptinolite. Some parts in the micashists are with proces of feldsparization which conditioned the appearance of the numerous pegmatite wires. Following to foliation in micashists be found appears of graphitic schist. They are dark gray to black in color with obvious schist texture.

In graphitic schist can be found appears of quartz wires with small and variable dimensions which do not are interest. More significant is the occurrence at the village Preseka on the Osogovo, and surrounding of Vinica (Grlani and Dulica).

The Quartzites are most commonly encountered by the foliation on micashists. Occur in the form of fans and long tracks (a few hundred meters) and wide several dozen meters. These rocks are very fresh, with clearly schistosity and crushed. Frequently show granoblastic structure. The main mineral is quartz which participation ranges from 50-80%. From secondary minerals occur albite, ortoclase, epidote, muscovite and garnet.

Significant appears were concluded on Plackovica (Cuj Petel and Tarnov Chukar) where micashists are present in the form of elongated tracks in length to 700 m and a width to 250 m. They extend north – south and from the other rocks clearly distinguished by their mineral composition where quartz reaches over 80%. Here we can mention and the quartz tracks found by the valley of the River Stanachka till Kriva Palanka. Also interesting appears of quartzite are defined at the area of Vinica near the village Crn Kamen. The formation of the micashiste in Pelagonia is quite widespread but it was not a separate series with a certain stratigraphic position, but

with gneisses constitute one series. The largest distribution have on Kaimakchalan, Selecka Mountain, Babu, Dautica, Karadzica, Kitka etc.

Depending on the composition of micashists occur in several varieties including: garnete, garnete - graphite, garnete - distend and garnete - distene - staurolithe.

Micashiste formation from Pelagonia there was really no significance, but still is marking the appearance of quartzite tapes with smaller dimensions.

In the Vardar Zone the formation of micashiste has been represented on several locality as follows Gradechka Mountain, Kozuf, Bucimand others. It occupies the upper metamorphic complex and lies through a series of the gneisses. At this gneisses - micashiste series often is occur quartz - graphite schist and leptinolite, which facies succeed each other both in the vertical and horizontal direction. In the quartz – graphite schist in some places dominates quartz with over 70% so they are often singled out as a series of the quartzite [1].

Within the Vardar zone in the formation of micashists are separated parties from pure quartzite (Ivevo, Gabrevci, Dedino, Radovich). Occur in the form of small layers. They are stronger than surrounding rocks, so stick out in relief. By color are mostly yellowish. They are composed of quartz and andrecrystallized silicate cement binder with weak participation of mica, chlorite and iron hydroxide. Have a large size to 1 km in length and width to 20 m. Depending on its purity can be economically very interesting.

Hydrothermal quartz wired are quite rare and almost insignificant.

3. FORMATION OF PELAGONIAN GRANITES

This formation is known and described as "Prilep granites" and is widespread on the mountain massifs Babuna, Kajmakchalan, Nidze, Mukos and Selecka Planina. This formation is presented with a number of large granite masses and small bodies from granodiorite composition concentrated mainly along the axis of Pelagonian and they are associated with precambrian metamorphic complex.

Based on the structural - textured characteristics and mineral content

pelagonian granites are distinguished on two types of granodiorites: porphyritic biotite granodiorites and medium grained to large grained massive granodiorites.

Porphyritic biotite granodiorites are occur in irregular elongated bodies pressed into the wings of anticlinal structures. Such larger bodies are discovered on t Mukos, then Selecka Planina and especially on the northern slopes of wreath Nidze - Kajmakchalan. Porphyritic granodiorite is large grained gray rock with porphyritic structure and

schistosity texture and, built from plagioclase, orthoclase, microcline, quartz and biotite. Quartz participation from 24-43%.

The massive type of granodiorites dominate on the field in the form of small irregular bodies and very large masses formed in anticlinal structural forms. Larger granodiorite masses of this type are found near Prilep and in the

central part of Selecka Planina. These granodiorites appear as gray to dark gray rocks, large granular with hypidiomorphic grain structure and massive texture. The main minerals occur plagioclase, K-feldspar, quartz and the biotite. Quartz involved 22-43%.

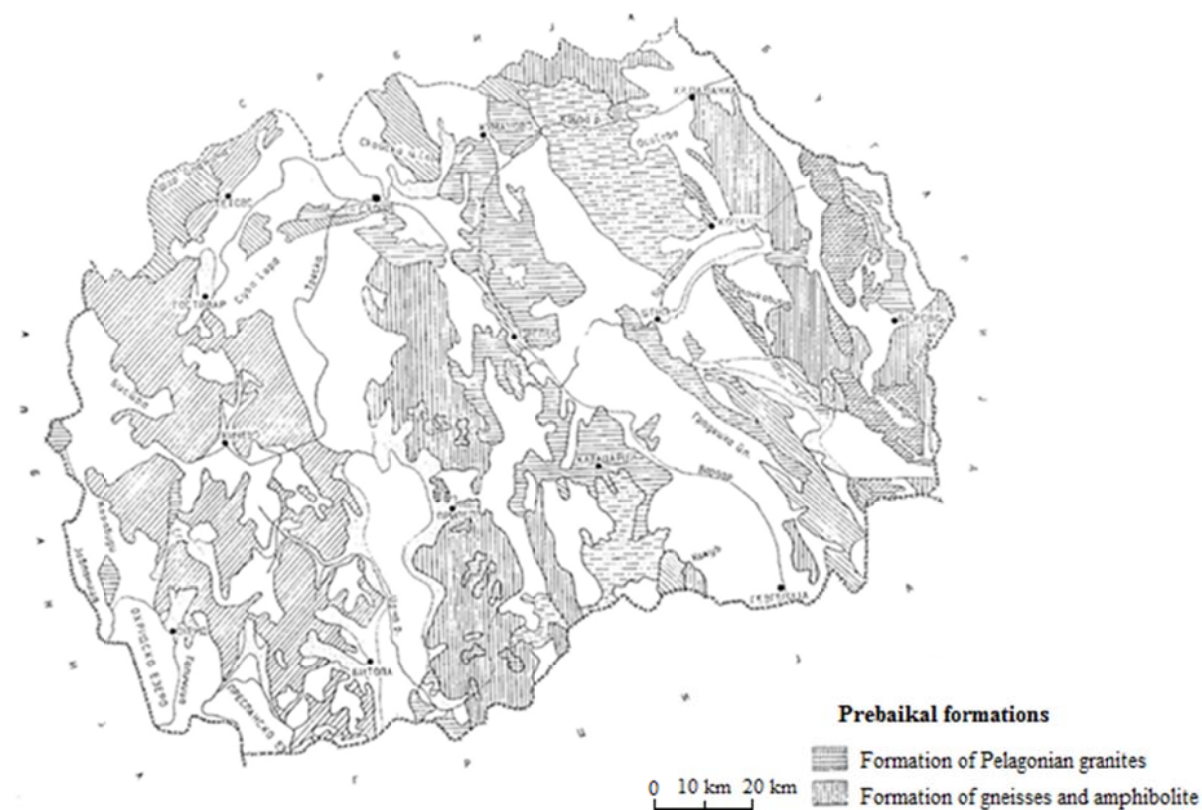


Fig.1 Prebaikal formations within the map of silicate raw materials on the territory on R. Macedonia

In the formation on gneisses and granodiorites can be found numerous occurrences of wires and lenses from aplite, quartz and pegmatite bodies embossed in the form on concordant and discordant injections. Occurred as a result of the final phase of activity on granodiorite magma in Pelagonian which is rich in silicate solutions and easily volatile compounds. Using cracks and faults in the surrounding rocks are inscribed themselves and steered forming various quartz bodies [3].

A quartz occurrences are very widely disseminated particularly in the area on Selecka Planina, but with smaller dimensions.

These kind occurrences are encountered in surroundings of Lipa, southwest of Gorno Selo, Budi Maz, the monastery bearings, Derven etc [3]. These wires fulfill the cracks in the direction of extension NW-SE and declined 80°. The thickness of the quartz veins and wires ranging from 2-10 m. Larger lenslike irregular bodies occur in villages Chanishte, Paralovo, Proluka, Skocivir, Makovo, Maloruvci etc. Occurrences are with pure quartz milky-white in color with rare shells on muscovite and feldspar grains. They are characterized by high quality and represent a particular economic interest.

CONCLUSION

In the paper we present the research results of the bearers of silicate minerals on the territory of Macedonia as economic deposits and their exploitation.

Silicate quartz raw materials (quartz, quartzite) have great application as industrial raw materials in electrical industry. For obtaining pure silica metal used quartz with purity of 99% SiO₂ and harmful components > 0.05% on Fe₂O₃ and Al₂O₃. Metamorphic quartzite raw materials with lower silica content SiO₂

(95 -97%) find their benefits of getting ferosilicium alloys.

In these studies we concluded that prebaikal formations, formation of gneisses and amphibolite with deposits of pegmatite, micashiste formation and formation of Pelagonian granites are the most important bearers of silicate quartz and quartzite raw materials not only in the Republic of Macedonia but also on the entire Balkan peninsula.

REFERENCES

- Adjigogov L. Final report for regional investigation of quartzite in Vardar zone, 1971.
Blazev K. Minerageny of silica raw material in Macedonia and their economical importance, Doctoral thesis, Faculty of mining and geology, Stip, 1991
Paskalev P. Quartz and quartzite in SRM, 1990
Trajanov G. Report for geological investigations of quartzite near Orlov Kamen - Kavadarci, 1982