35th INTERNATIONAL OCTOBER CONFERENCE on Mining and Metallurgy

41

35th INTERNATIONAL IOC OCTOBER 2003 CONFERENCE

PROCEEDINGS

Edited by
Radoje V. Pantović

University of Belgrade, Technical Faculty Bor
Yugoslavia

HEMATITE MINERALIZATION RELATED TO THE METAQUARTZITES IN THE MIDINCI SITE (WESTERN MACEDONIA)

O. Spasovski, V. Mircovski
Faculty of Mining and Geology Stip, Republic of Macedonia

ABSTRACT

Latest field and laboratory investigations carried out on the hematite mineralization in the vicinity of the village of Midinci offered new information on the type of mineralization related to metaquartzites. Latest laboratory studies, first of all those of ore microscopic made it possible to get a complete understanding of the nature of the major minerals. The more significant structures and textures were determined for the first time that made possible the determination of the sequence of the development of the major ore minerals including, also, the determination of the genetic type of mineralization.

Key words: Midinci, ore minerals, ore bodies, structures, textures, magnetite, hematite.

INTRODUCTION

The hematite mineralization in the Midinci site is situated west of the Kicevo - Gostivar road some 350 meters north of the village of Midinci.

Several researchers studied the mineralization over the past years. The most important are the works of Jancic, Popovic et. al. (1963), Popovic, Vujanovic (1965), Popovic (1980, 1995), Dumurdzanov (1977). Lately, this mineralization has been subject of investigations of the present authors.

The mineralization occurs as a 100 meters long and several meters thick lens-like ore bodies. The mineralization can be traced 150 meters in length to the east-west, and 50 meters to the north-south. It can be encountered up to 60 meters in depth.

GEOLOGICAL ENVIRONMENT

The wider vicinity of Midinci is made up of quartz-sericite-chlorite schists, metasandstones, metarhyolites and metatuffs, quartz-sericite schists, metasandstones, metaquartzites and metadiabases, Pliocene sediments, proluvial as well as alluvial sediments (fig. 1).

The quartz-sericite-chlorite schists were discovered as lowermost horizon of the Ordovician mass. They have developed between Recani and Baciste. Here they extend towards Midinci, occurring also south of the village (fig. 1). Quartz-sericite schists and metarhyolites can also be found in the horizon.

Quartz-sericite-chlorite schists are fine-grained, seldom medium-size-grained, grey-greenish in colour, made up of quartz, sericite, chlorite and some clayey material.

Metarhyolites and metatuffs can be found in several places in the series occurring as larger masses near Midinci (fig. 1). In the mass, they alternate quartz-sericite-chlorite schist stripes and quartz-sericite schists.

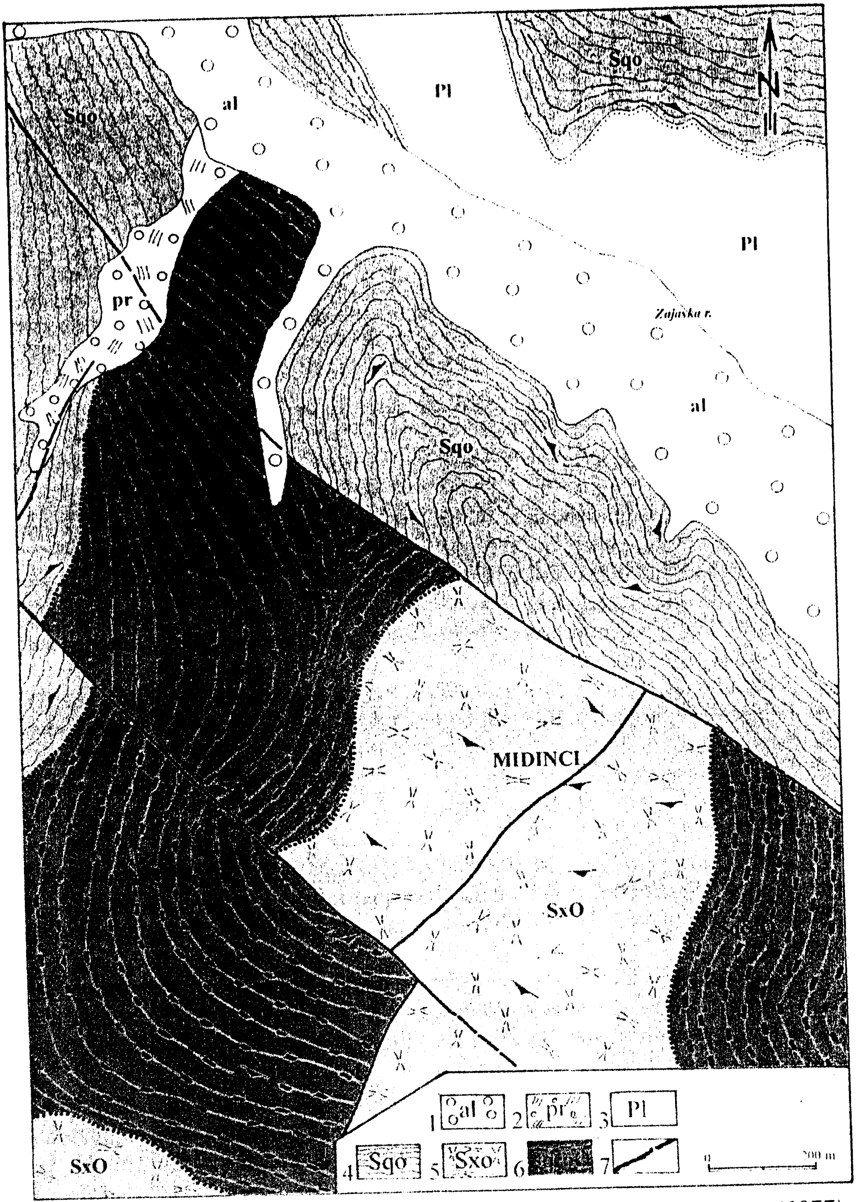

Fig. 1. Geological map of the Midinci occurrence after Dumurdzanov (1977)
1. Alluvial sediments, 2. proluvial sediments, 3. Pliocene structures, 4. quartz-sericite schists and metasandstones, 5. metarhyolites and metatuffs, 6. quartz-sericite-chlorite schists, 7. faults.

Quarzt-sericite schists and metasandstones occur as a horizon overlying the horizon of quartz-sericite-chlorite schists and metasnadstones. Quartz-sericite-chlorite schists are fine-grained, schistose, made up of quartz, sericite and non-crystallised calyey matarial. Metasandstones are made up of quartz grains, seldom feldspars connected with sericite material.

Metaquartzites have been determined as a separate petrogenic unit and the characteristic hemetite mineralization was encountered only north of the village of Midinci. In addition, metaquartzites contain gradual transitions from quartz schists, sericite quartzite, chlorite-sericite quartzites, chlorite-sericite to sericite-chlorite schists.

The metaquartzites also contain hematite mineralization of variable amount of hematite ranging from traces to massive hematite (fig. 2).

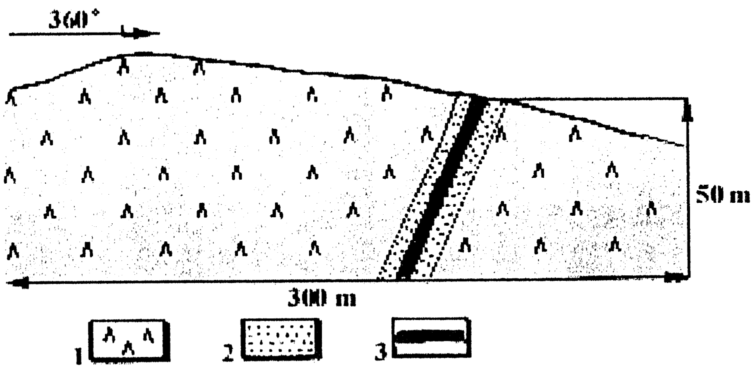

Fig. 2. Schematic geological cross-section of the hematite mineralization of Midinci. 1. Chlorite-sericite schists, 2. metaquartzites, 3. hematite mineralization.

Metarhyolites and metatuffs occur in several places in the series, the largest amounts being those near Midinci (fig. 1). The volcanics alternate quartz-sericite-chlorite and quartz-sericite schists stripes.

Quartz-sericite schists and metasandstones occur as a horizon that overlies the quartz-sericite-chlorite schists horizon and metasandstones.

MINERALOGICAL CHARACTERISTICS

Jancic (1963) and Popovic, Vujanovic (1965), Dumurdzanov (1977), Popovic (1995) studied the mineralogical composition, structural-textural characteristics, paragenetic relationships and the mineralization style within the hematite mineralization of Midinci.

Ore microscope studies determined the minerals as follows: hematite, limonite, pyrite, magnetite and chalcopyrite. The non-ore minerals group consists of quartz and occasional occurrences of feldspar. The major and most important mineral is hematite. Limonite, pyrite, magnetite and chalcopyrite occur as accompanying minerals. Micromorphological shapes and the occurrence mode of the major ore minerals are given in fig. 3.

STRUCTURAL-TEXTURAL CHARACTERISTICS OF MINERALIZATION

The structural-textural characteristics of the hematite mineralization in the site have not been sufficiently studied. According to the studies of the present authors, an attempt has been made to give an overview of the most significant structures and textures.

Striped macrostructure - is characterised by thickness of stripes verying from traces on the surface up to 2mm. The stripes are hematite alternating with quartz.

Striped microtexture - is characterised by orientation of the regenerated hematite along the direction of schistosity.

Impregnated texture - is characterised by accompanying minerals such as limonite, pyrite and chalcopyrite. The ore minerals are irregularly distributed in the quartz matrix.

Replacement structures - occur due to descendent changes of primary pyrite. Pyrite is completely replaced by limonite preserving only the shapes of pyrite grains. Limonite often occurs as regular shapes inherited from the pyrite grains. It seldom occurs as hipidiomorphic and alotriomorphic grains. The borders between pyrite and newly developed limonite are rather distorted and indented.

Relic structures - are a characteristic of pyrite occurring as relict in limonite (fig. 3b). This kind of structures is due to the incomplete replacement process where there are pyrite relics in individual limonite grains.

Structures of replacement - are characteristic for the younger phase of hematite (flaky hematite) that surpresses the primary.

GENETIC CHARACTERISTICS

Hematite mineralization belongs to the sedimentary-metamorphosed genetic type. It is assumed that iron and silica were transported by volcanic hydrothermal solutions. Most probably hydroxides of iron and silicium developed first and in the further evolution iron hydroxides transformed to oxides or hematite with excess of carbon, and silicium to quartz schists. During the evolution quartz and iron mineralization were affected by several tectonic changes (regional dynamometamorphism) and thermal changes (by the influence of younger hydrotherms). As e result, a thermal (younger) hematite, pyrite, feldspar and quartz developed. Hematite is most commonly distributed along the surface of schstosity and some in the cracks. Thus, the striped appearance of primary (sedimentary) and regenerated (thermal) hematite overlap in some parts (fig. 3 a and b).

Regenerated hematite differs from primary because it always shows crystal form (flaky hematite) when the crystals reach 2 cm in length. Large hematite crystals have been noticed in the cracks of rocks where they had favourable conditions to develop. Regenerate hematite more or less replace the primary one.

During further hydrothermal processes intense silification and feldspatisation took place resulting in newly developed quartz, quartz-hematite and quartz-feldspar veins. As a result, young hydrothermal quartz occurs here in addition to the primary that helped silification not only of iron quartz but chlorite-sericite schits as well.

The importance of this mineralization lies in its metallogeny, since it is a unique mineralization style in Western Macedonia.

CONCLUSION

Taking in consideration data of earlier and those of the present authors about hematite mineralization of the Midinci site the following can be inferred:

Hematite mineralization related to metaquartzite has been determined in the area of Midinci,

Mineralzitaion occurs as stripes of various thickness (it can be said conditionally that they are interbeds) varying from traces on surfaces of schistosity up to 2 mm thick. The largest hematite concentration found in the area amounts to 1.5 meters.

The hematite mineralization belongs to the sedimentary-metamorphic genetic type,

The importance of this mineralization is in its metallogeny since it is a unique type of mineralization in the area of Western Macedonia.

REFERENCES

1. Dumurdzanov, N., 1977: Izvestaj za geoloskite istrazuvanja na zeleznata mineralizacija vo okolinata na selo Midinci (Kicevsko). Str. fond na Geoloski zavod, Skopje.
2. Jancic, T., Popovic, R., i dr. 1963: Izvestaj o geolosko-geofizickim istrazivanjima na pojavama ruda gvodza u oblasti Kiceva i Gostivara. fond strucnih dokumenata Geoinstituta, Beograd.
3. Popovic, R., Vujanovic, V., 1965: Pojava regeneracije u Fe-lezistu kod s. Midinci (Kicevo). Zapisnici Srpskog geoloskog drustva za 1965. Beograd 1969, str. 537-540.
4. Popovic, R., 1995: Gvodze i mangan Zapadne Makedonije (Metalogenetske epohe i rudna lezista), Posebna izdanja Geoinstituta, knjiga br. 16, Beograd.