

GEOLOGICAL STRUCTURE AND GENESIS OF Zn, Pb DEPOSIT RIBNIK-ŠUPLJA STIJENA

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Abstract

The Zn Pb Ribnik deposit is the last in a series of Šuplja Stijena-Đudjeve vode-Paljevine-Ribnik deposits going from the northwest to the southeast, and it is connected to all of them by an adit, which connects all four deposits of the "Šuplje Stijene" ore field. The Šuplja Stijena ore field is located on the Ljubišnja mountain.

Geological investigations of lead and zinc mineralization in the Šuplja Stijena ore field were carried out over a long period of time, and resulted in the discovery of economically significant deposits: Šuplja Stijena (within which the East area, West area and Stara jama were opened), Đurđeve vode, Ribnik and Paljevine.

The geological structure of the Ribnik deposit consists of andesites that are in direct contact with the Ladinian limestones.

Keywords: Zn Pb deposit, andesites, hydrothermal polymetallic sulphide lead-zinc deposit of vein impregnation type.

1. INTRODUCTION

The Zn Pb Ribnik deposit is the last in a series of Šuplja Stijena-Đudjeve vode-Paljevine-Ribnik deposits going from the northwest to the southeast, and it is connected to all of them by an adit, which connects all four deposits of the "Šuplja Stijena" ore field. The Šuplja Stijena ore field is located on the Ljubišnja mountain.

The lead and zinc mine Šuplja Stijena, and therefore the Ribnik deposit, are located in the area of the former mining settlement of Šula, which is connected to Pljevlja via Gradac.

The ore-bearing area of the Ljubišnja mountain, which includes the zinc and lead deposit Ribnik, is located in the northern part of Montenegro and the eastern part of Bosnia and Herzegovina.

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Geological investigation in the Ribnik deposit began in 1955 with mining exploration works and lasted until 1960. In 1967, research was continued in the deeper parts of the deposit by drilling from the surface. Continuation of the geological investigation moved to the southeast using geophysical methods during 1970. In 1972, geophysical anomalies were verified by the drilling. In the period from 1987 to 2012, no geological investigation was carried out in the area of the Šuplja Stijena mine. New geological investigations in the Ribnik deposit were carried out in 2021

and 2022, and they were carried out by drilling as the basic method, namely inclined exploratory drillholes [1].

2. GEOLOGICAL STRUCTURE AND GENESIS OF THE DEPOSIT

The geological structure of the Ribnik deposit consists of andesites that are in direct contact with the Ladinian limestones [1] (Figures 1 and 2).

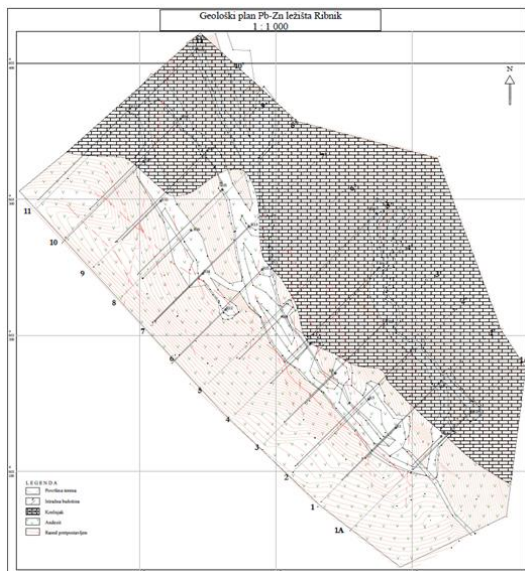


Figure 1. Geological plan of the Ribnik deposit

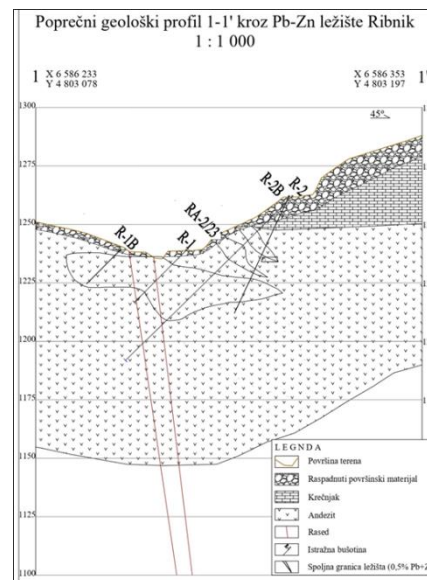


Figure 2. Transverse vertical cross section 1-1'

Geological logging of the core of exploration drillholes shows that the andesites are compact or crushed, partially silty to silty, oxidized.

Macroscopic examination of the samples showed that the andesites are light gray to greenish in color, predominantly green (on a fresh fracture). There are frequent deviations in color, and the appearance of thin crust in dark gray, light to dark brown color, which indicates that the andesites have been intensively hydrothermally altered [1 i 2] (Figure 3).

Some of the samples taken for ore microscopy were found to be kaolinite alteration, which was also defined by earlier research. Sulfide mineralization occurs in the form of bursts and accumulations that form nests and veins, and impregnations of pyritic +Pb-Zn mineralization that form vein forms and smaller lenses are visible on the andesites.



Figure 3. Characteristic appearance of andesite from the Ribnik deposit

- a) hydrothermally altered andesite (drillhole R-18, interval 5.10-5.20 m, sample dimensions $\sim 10 \times 8 \times 4$ cm);
b) hydrothermally altered andesite (drillhole R-14, interval 36.60-36.70, sample dimensions $\sim 10 \times 8 \times 4$ cm),
c) hydrothermally altered andesite (drillhole R-4, 58.60-58.70, sample dimensions $\sim 15 \times 6 \times 3$ cm); d) intensive kaolinized andesite (drillhole R-8, 88.25-88.40, sample dimensions $\sim 15 \times 6 \times 3$ cm).

The limestone is crushed, cracked, broken, partly compact, silty, breccia. The color is dark to light gray (Figure 4).



Figure 4. Appearance of limestone from the Ribnik deposit

- On which ore mineralization (Pb-Zn +pyrite –chalcopyrite) is visible in the form of veins and wires (well R-16, interval 39.50-39.60, sample dimensions $\sim 10 \times 8 \times 4$ cm)

The ore body is represented by two ore vein with 5-6 apophyses that separate from the main veins. The direction of extension is northwest-southeast, with a dip of 50-60°. By logging of the exploratory drillholes, smaller lenses were also identified. The ore veins are interrupted in their southeastern part, probably cut by a fault [1 i 2].

The Ribnik deposit, which belongs to the "Šuplja Stijena" ore field, is a hydrothermal polymetallic sulphide lead-zinc deposit of the vein impregnation type.

Based on existing data, it is considered that the Ribnik deposit was created at shallower depths and at slightly lower temperatures than the other deposits in the "Suplja Stijena" ore field, as indicated by the frequent gel structures [1 i 2].

The parent rocks are built mainly of andesite-lava, in which the deposition of ore minerals was carried out in several phases (at least three) in the Triassic, but after the hardening of the volcanics, in which the largest amounts of mineral deposits known so far occur.

The deposits of the "Suplja Stijena" ore field were created in a very wide temperature interval of the hydrothermal area - from high temperature representatives to minerals that are the product of low temperatures [1 i 2].

3. CONCLUSION

On the basis of the results obtained by testing the physical and chemical processes that took place during the formation of "Šuplja Stijena" ore field, it can be concluded:

1. That regional pyritization, involving eruptive masses, was carried out at the time of propylitization;
2. That the oldest generation of pyrite is not directly related to the formation of the mine, but precedes this process;
3. That the main ore minerals of the "Šuplja Stijena" ore field were created in the temperature interval from 225 to 300°;
4. That the presence of sphalerite stars in chalcopyrite, in the deeper parts of the deposit, allows the interpretation of raising the limit of the formation temperature to the highest level of hydrothermal processes.

On the basis of the tests carried out, it is considered that the ore-bearing solutions were acidic in nature.

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