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Distribution of Valuable Metals in Various Horizons of "Trepça" Mine

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Abstract: Trepca mine in Stanterg dates from 1930 as giant mining complex, and it is known across the world with a high grade of Pb, Zn and Ag minerals. Furthermore, this mine is enclosed by mineralogy zones with high grade of ore and considerable reserves. In this paper will be discussed variable grade of ore taking into account the orebodies which are dipping at considerable depth under the earth crust. Evaluation and definition of geological resources in deposit is done on the research and production phase. During the exploration phase, the knowledge in regard to mineral resources will make clear the point of view on aspect of ore grade. Whereas, during the production phase is more realistic data on ore grade are available. Evaluation of ore grade and resources of a particular deposit, planning and control of grade are the first three actions are important during exploitation phase of mineral resources. Moreover, mine planning for long or short term has an impact on evaluation process. In this paper are conducted several ore bodies and are taken many samples during the production phase in various horizons.

Keywords: *Mine, ore grade, depth, orebody, deposit.*

Introduction

Geological characteristics of Trepca Mine deposit

Polymetallic mineralization of Pb and Zn in Kosovo are found in the northeast and southeast zone of Kosovo. This region is an objective of geological, geophysics and geochemistry researches. Many researches took place, played on important role and have paid much more attention to this zone of mineralization. The orebodies in Trepca mine are surrounded by accompanying rocks as following; schist, limestone – dolomite, and green schist formations. The geological formation of the zone is compounded these formations and rocks, peridotite, gabbroic rocks.

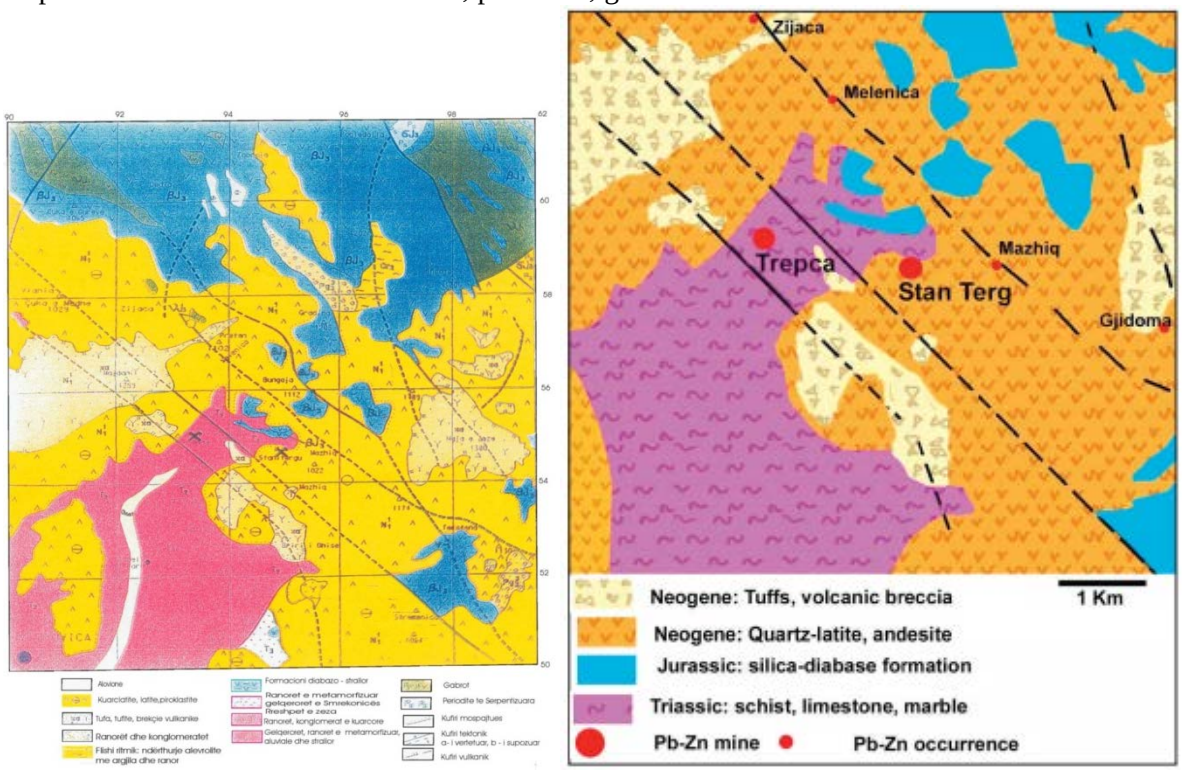

Figure 1. Geology of Trepca Mine -Stanterg

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Tectonic characteristics of Trepca Mine - Stanterg

The tectonic analysis of the deposit is being studied for many years from national and international research for its complexity. Based on the recently researches is stated that this deposit has a complicated tectonic. The region of the tectonic which is being studied is followed by fractures with a dipping angle >74°. Tectonic characteristics of this region are responded to main geological structure with elements dipping angle 170-198°. The orientation of this structure is proportional by quartz eruption. Meanwhile, new researches on field have reported that there is a separated tectonic that is followed by deformations.

Mining Method in Trepca Mine - Stanterg

Trepca mine has a complex mineralogy and as a result several mining methods are used to exploit orebodies. These mining methods are as following; room and pillar, shrinkage, sublevel caving and cut and fill mining method. Below in figure 2 is presented the mining method in trepca mine.

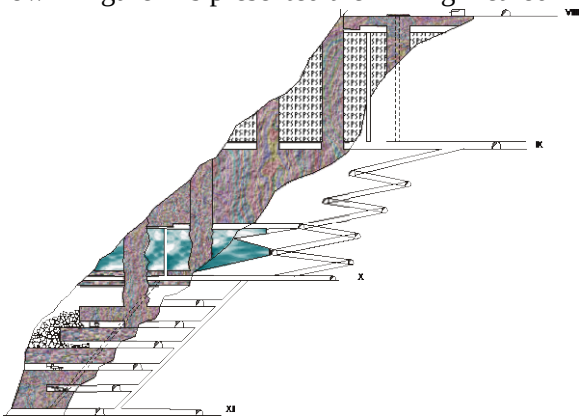

Figure 2. Mining method in "Trepçës" mine

Ore sampling and Statistical distribution

In a particular workshop 149-C3 in Trepca mine 53 samples are conducted during the production phase, and per working shift 1 sample is conducted. All these samples are send to laboratory for analysis. Evaluation of metal content of Pb mineral was analysed. In the following figure in a 3D view is presented the workshop where the research took place.

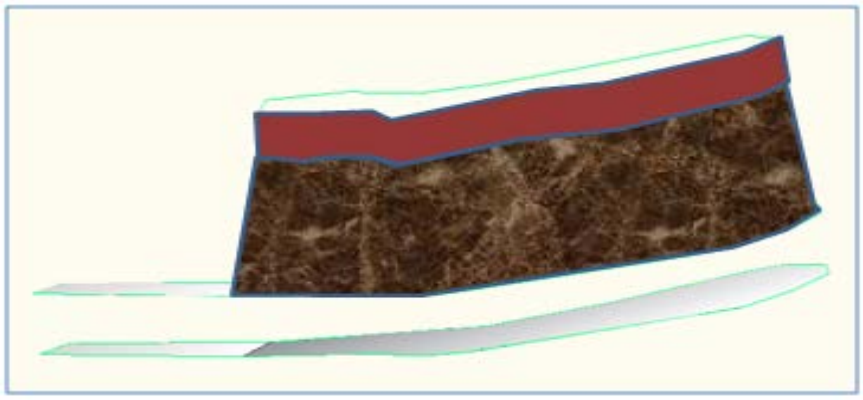

Figure 4. Presenting workshop 149-C3 in 3D

In the laboratory results of Pb (%) content are as following: 2.60; 4.28; 2.01;4.48; 2.34; 3.65; 5.43; 4.76; 4.76; 4.88; 5.52; 5.66; 4.20; 3.80; 4.29; 1.20; 3.72; 2.80; 2.93; 4.81; 2.85; 5.35; 1.15; 3.69; 2.26; 3.73; 4.68; 5.94; 3.74; 2.98; 3.0; 4.32; 4.39; 1.85; 4.36; 2.72; 2.50; 2.44; 6.0; 4.0; 4.18; 2.29; 4.0; 3.99; 2.84; 3.92; 4.44; 4.50; 4.40; 2.95; 3.0; 3.80; 2.0.

After collecting data, lower and high value of the samples have to be known. Afterward, table 1 will be constructed as following;

Table 1. Distribution of Pb in analysed samples

Classes	Bin (Ore grade of Pb [%])	Frequency
I	1.0-1.50	1
II	1.60-2.0	3
III	2.01-2.50	5
IV	2.60-3.0	11
V	3.10-4.0	11
VI	4.10-4.50	9
VII	4.60-5.0	7
VIII	5.10-5.50	4
IX	5.60-6.0	2

By using data presented in Table 1, will be constructed the histogram as following;

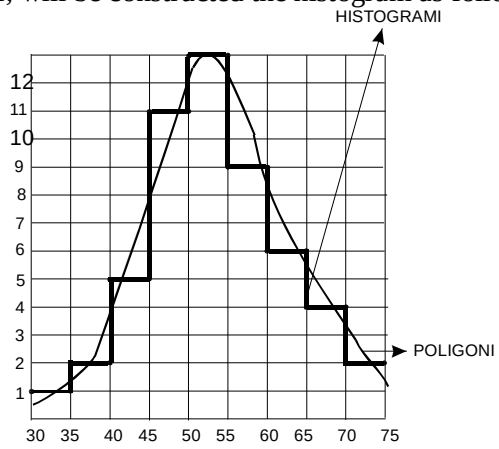

Figure 5. Histogram according to ore sampling

Ore grade analysis in various horizons in Trepca Mine-Stanterg

Since the mine started to be exploited the ore grade is monitored in all orebodies. In various horizons and workshops samples are conducted and is prepared a report on evaluation on control of ore grade of Pb, Zn, and Ag. Analysing the high and low content of metal in the particular orebody. Evaluation of ore grade is performed during geological exploration form drilling. Metal content of Pb, Zn and Ag for several orebodies are evaluated during the exploitation phase and samples are sent for furthermore analysis in laboratory. In tables 2, 3, 4, 5, 6, and 7 is presented variable ore grade of each ore body in various horizons and workshops, also these changes in ore grade are presented on diagrams 1, 2, 3, 4, 5 and 6.

On tables presented above it is shown a clear idea on changes of metal grade and/or content per each horizon. These changes on metal content leads to understand the origin and mineralogy of the deposit.

Table 2. Ore grade of orebody "A"

Horizons	Workshops	Grade		
		Pb (%)	Zn (%)	Ag (gr/t)
VIII	P-120/3	1.1	0.33	112
IX	P-130	4.27	1.43	128
X	P-140	2.98	1.77	102
XI	P-150	4.48	4.04	102

Table 3. Ore grade of orebody "B"

Horizons	Workshops	Grade		
		Pb (%)	Zn (%)	Ag (gr/t)
VIII	P-127	2.27	1.88	40
IX	P-137/1,2	3.6	2.05	60
X	P-147	7.78	4.05	149
XI	P-157	5.14	3.57	83

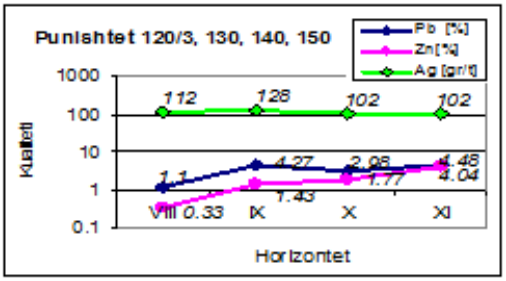

Figure 3. Distribution of ore grade

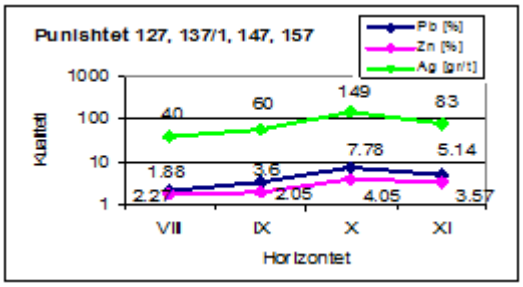

Figure4. Distribution of ore grade

Table 4. Ore grade of orebody "C"

Horizons	Workshops	Grade		
		Pb (%)	Zn (%)	Ag (gr/t)
VIII	P-123	7.82	4.35	57
IX	P-133/38	4.11	2.22	64
X	P-143/48	5.33	7.73	88
XI	P-153/158	4.2	4.28	93

Table 5. Ore grade of orebody "D"

Horizons	Workshops	Grade		
		Pb (%)	Zn (%)	Ag (gr/t)
VIII	P-127/A1	5.38	2.73	71
IX	P-137/A1,2	5.38	2.73	77
X	P-147/A	7.75	4.35	83
XI	P-157/A*	7.87	4.15	149

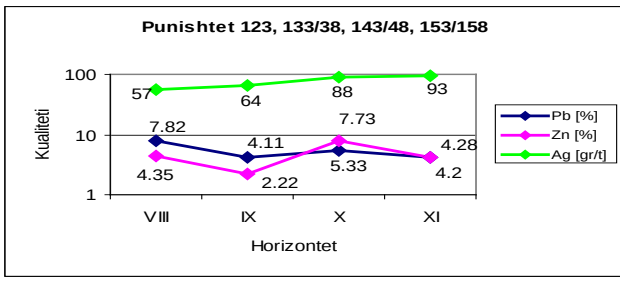

Figure5. Distribution of ore grade

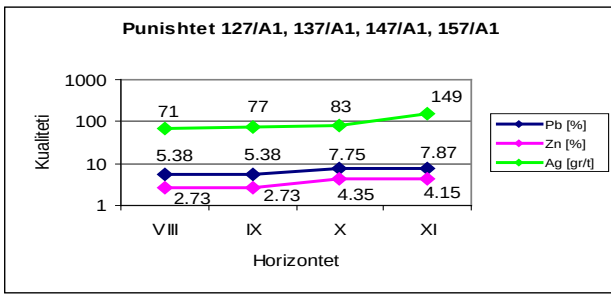

Figure6. Distribution of ore grade

Table 6. Ore grade of orebody "E"

Horizons	Workshops	grade		
		Pb (%)	Zn (%)	Ag (gr/t)
VII	P-119/C	2.98	8.52	54
VIII	P-129/C	3.48	3.59	20
IX	P-139/C	2.08	5.44	60
X	P-149/C	3.4	5.9	55

Table 7. Ore grade of orebody "F"

Horizons	Workshops	Grade		
		Pb (%)	Zn (%)	Ag (gr/t)
VIII	P-129/C3	3.84	3.59	54
IX	P-139/C3	3.54	7.09	45
X	P-149/C3	3.54	3.2	45
XI	P-159/3	3.45	2.99	44

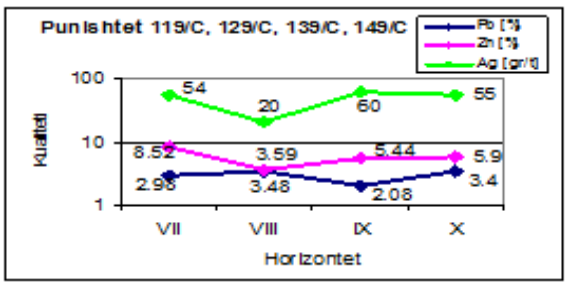

Figure7. Distribution of ore grade

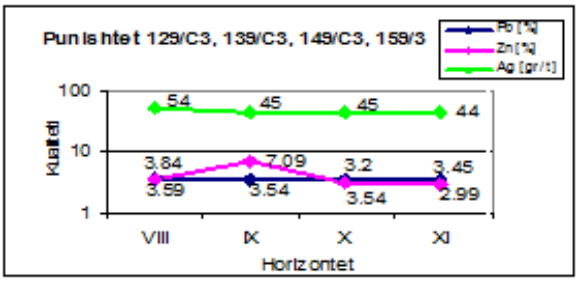

Figure8. Distribution of ore grade

Conclusion

The research conducted includes geostatistic analysis application in mining engineering, based on underground exploitation mining methods and applied methodology of ore grade control.

Practical research is focused in Trepça Mining workshops in Stanterg, forming a wide variation of ore grade, as in horizontal and vertical dipping. Also, in these workshops is applied the method of filling and it is considered as on of the factors that could be influenced in research.

The objectives of this paper from the professional and scientific point of view has its own importance in ore exploitation, at the same time creates the possibility for stabile and quality planning.

Evaluation of grade of ore in a horizontal and vertical dipping of mining ore bodies offers an scientific proof in economical issues and evaluations per a particular deposit, the exploited cost and mineral processing, from selling and processing the concentrate of the ore.

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