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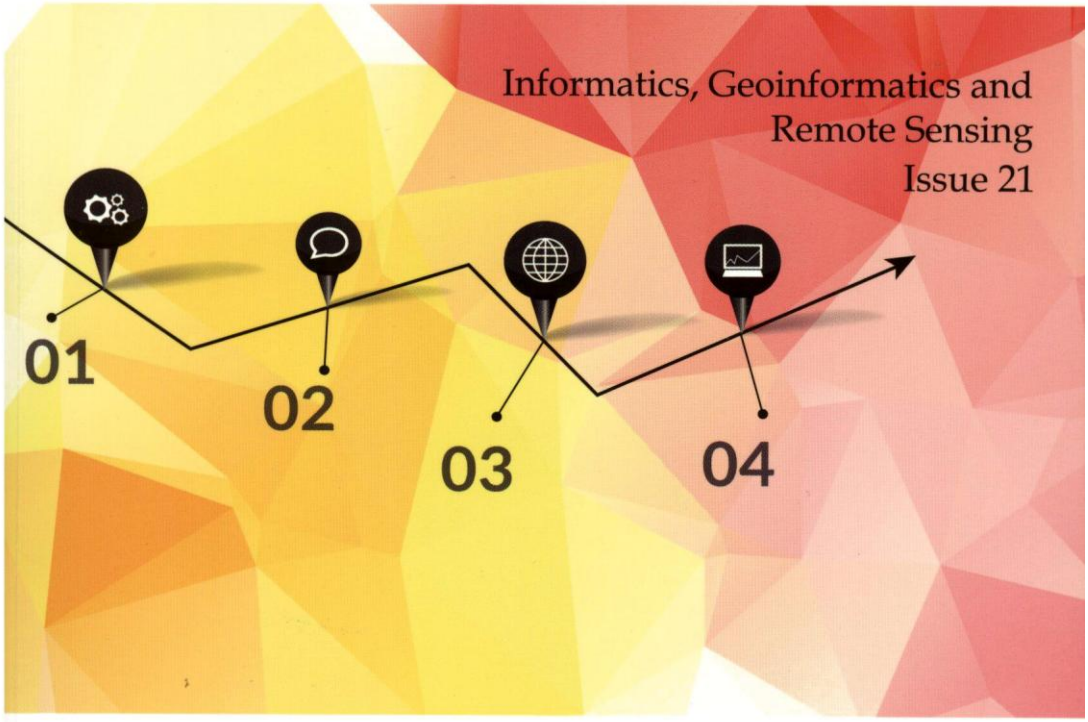

INFORMATICS
GEOINFORMATICS

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SECTION INFORMATICS

ORGANIZATION OF THE ACCESS DATABASE FOR THE KADIICA MINERAL DEPOSIT, REPUBLIC OF MACEDONIA

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ABSTRACT

Organization of the Access database of the Kadiica copper deposit Eastern Macedonia represents the first attempt of this paper authors to synthesize geological exploration data of this ore bearing locality in one professional database available for the wider auditorium. Authors experience in organization of similar databases for other metal deposits such are Bucim, Borov Dol, Zletovo, Sasa etc., gave us an opportunity to construct quality Access database for the Kadiica deposit. This deposit is of porphyry type with particular development of cementation zone where secondary minerals dominate. The chalcocite and covellite as main ore minerals in the ore body (600 m long and 100 m thick) pointed out that we are in the upper parts (oxidation-secondary enrichment zone) of a system with very likely porphyry type mineralization associated with porphyries in the deeper part of the system. Our latest paper focuses on efforts we made to organize Microsoft Access database with the most representative data for this particular deposit in the Republic of Macedonia. At the very beginning, with the software package "Microsoft Access" we have organized database with information of the most important geological, metallogenic and economic features of the deposit. The database was adapted for simple and sophisticated querying of particular deposit features and allows edition of reports and a geographic display of the queried information. Major data that completed database for the Kadiica deposit are: the deposit is at the prospect and detailed geological study with copper potentials, the Kadiica deposit is of combined type porphyry copper type complemented by secondary Cu sulphide (cementation) morphology, mineralization/rocks part of the database showed the mineralization age (relative 13.4-15.9 Ma; absolute 15 Ma) and host rock age (relative 28.4 - 23.03 Ma; absolute 26 Ma, K/Ar method) with main host lithology consisting of dacite, andesite, dacite–andesite breccia and their varieties, economic parameters were dominated by the fact that of proved mineral reserves of 69 Mt (as of 2013 and copper concentration of 0.21% Cu) as well as measured mineral reserves of 90 Mt (as of 2010 and copper concentration of 0.22 % Cu), also on the comments section we stressed out that its metallogeny is related to Tertiary calk-alkaline magmatism (predominantly Oligo-Pliocene) where mineralization is in dacite comlex suite while ore bodies are mainly secondary enrichment blankets.

Keywords: Kadiica copper porphyry deposit, Access database, reserves, economy.

INTRODUCTION

The Kadiica–Bukovik ore district is located in the easternmost Surdulica–Osogovo–Thassos metallogenic zone [1], [2], [3], [4], which used to be characterized by the wide development of Pb-Zn mineralization. This regional metallogenic unit is 250 km long [5] and controlled by major fracture zones, spatial distribution of Tertiary magmatism and presence of numerous polymetallic mineralizations. Although base metals mineralizations (lead and zinc sulfides) dominate within this metallogenic zone with local occurrences of molybdenite and scheelite (stockwork-disseminated type of mineralization as well as hydrothermal quartz veins), recent discovery of the porphyry copper mineralization in the Kadiica ore district exhibited inconsistency with its metallogenic specialization and previous metallogenic model of this belt [6].

Copper mineralization at the Kadiica deposit, near the town of Pehchevo was recently discovered and preliminarily estimated. The host rocks represent hydro-thermally altered quartzlatites and partially schists (rocks subjected to alunitization, sericitization, and silicification). Copper mineralization in quartzlatites is developed as stockworks and dissemination. The known copper mineralization mainly occurs as su-pergene chalcocite and lesser covellite coatings on pyrite and rare chalcopyrite. Traces of chalcocite occur far below the base of oxidation. Primary copper grades are probably around 0.1% Cu or less and chalcopyrite is decidedly scarce. The copper distribution clearly defines the leached zone and an enriched copper zone. The copper distribution in the deeper part of most holes drilled does not define a well developed positive copper gradient. Major ore minerals are represented by pyrite, chalcopyrite, magnetite, and hematite. Enargite, pyrargyrite, tetrahedrite, galena, sphalerite and pyrrhotite are less common. Quartz is the main gangue mineral. In terms of morphology, link with porphyry intrusion, and composition, the deposit is classed with the copper porphyry type. Some of the aforementioned minerals and wallrock alterations are also typical of sulfidized epithermal deposits. The zone incorporates systems of sheeted bodies and discordant dikes of quartzlatites with an absolute age within 24–12 Ma.

Up to date, in the Republic of Macedonia there weren't professional databases that should be in accordance to the European directives, although there is an initiative in ours Ministry of Economy that such database(s) should be prepared and included in similar modern European databases (ex. BRGM Mineral database). Here we were aiming to organize databases with an information about some of the most representative Kadiica deposit feautures, regarding natural issues. Bearing in mind that the Kadiica deposit has a long history of exploration, we knew that building aforementioned database is not an easy task to fulfill. We had to systematize data from exploration longer than two decades. Organization of the Access database was carried out under several main topics, which are in accordance with the GIS related mineral databases principles given elsewhere [7], [8], [9], [10], [11], [12], [13].

DISCUSSION

The particular mineral database itself was structured under the following main topics:

General information where has been enclosed information about the mining company, status, latitude/longitude, ore district name, comments etc. (Figure 1). For example on our sample of the Kadiica deposit we gave an accent that it is a prospect with certain potentials in regards to copper and some other associated metals.

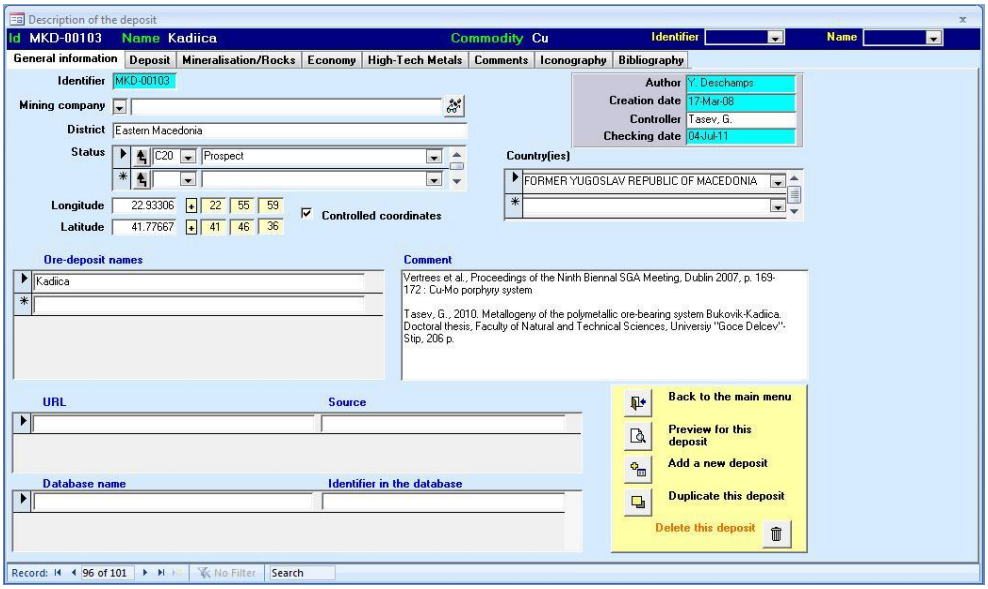

Fig. 1. General information datasheet of the database

That information was followed by detailed coordinates and name of the exploration concession owner, as well as familiar names used by locals for the locality and short general comments.

Deposit features sheet is organized in a manner that should be given details about the parameters: deposit type, main morphology and secondary morphology (Figure 2).

On our example deposit, Kadiica, we have entered data about the deposit's combined type where we have pointed out the its porphyry copper deposit type that is complemented by secondary Cu sulphide (cementation) deposit type morphology.

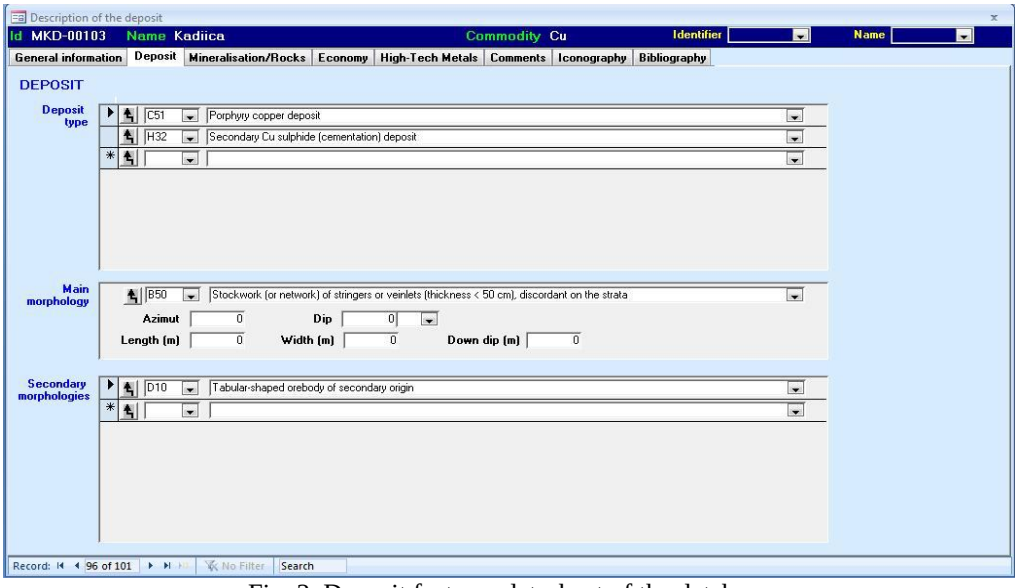

Fig. 2. Deposit features datasheet of the database

Mineralization/Rocks data sheet usually should contain data about age (supposed and absolute), ore mineralogy, gangue mineralogy, hydrothermal alteration, host rock (age supposed/absolute, host rock formation, name and lithology). All of them being grouped into separate main window (Figure 3).

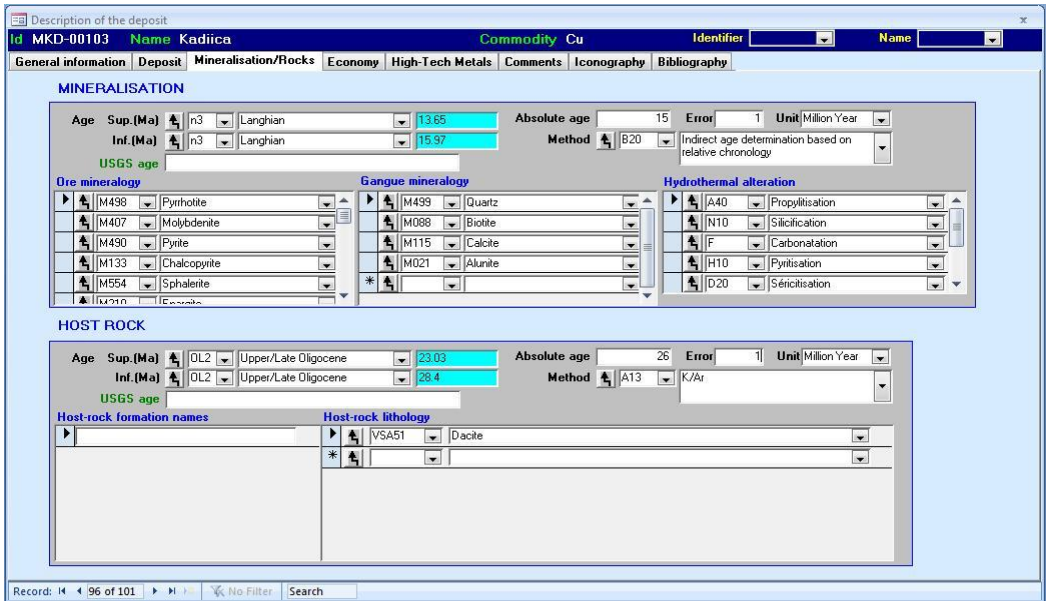

Fig. 3. Mineralization-rocks information datasheet of the database

This part of the database was filled with a significant amount of data regarding the mineralization age (relative 13.4-15.9 Ma; absolute 15 Ma), ore mineralogy (pyrrhotite, molybdenite, chalcopyrite, pyrite, chalcocite, covellite, galena, sphalerite, etc.), gangue mineralogy (biotite, alunite, calcite, quartz etc.) and diverse hydrothermal alterations (propylitization, silicification, carbonization, phyllitization, sericitization, advanced argillic, etc.). After that the database was enriched with an information about the host rock age (relative 28.4 - 23.03 Ma; absolute 26 Ma, K/Ar method) and host rock lithology (mainly dacite, andesite, dacite–andesite breccia with certain variaties, etc.).

Economy data sheet was planned to provide an information about ore type, grade unit, former production, average grade of production, years of exploitation, reserves, average grade, type of reserves, resources, average grade of resources, type of resources organized in windows named exploitation type, main commodity and commodity (Figure 4).

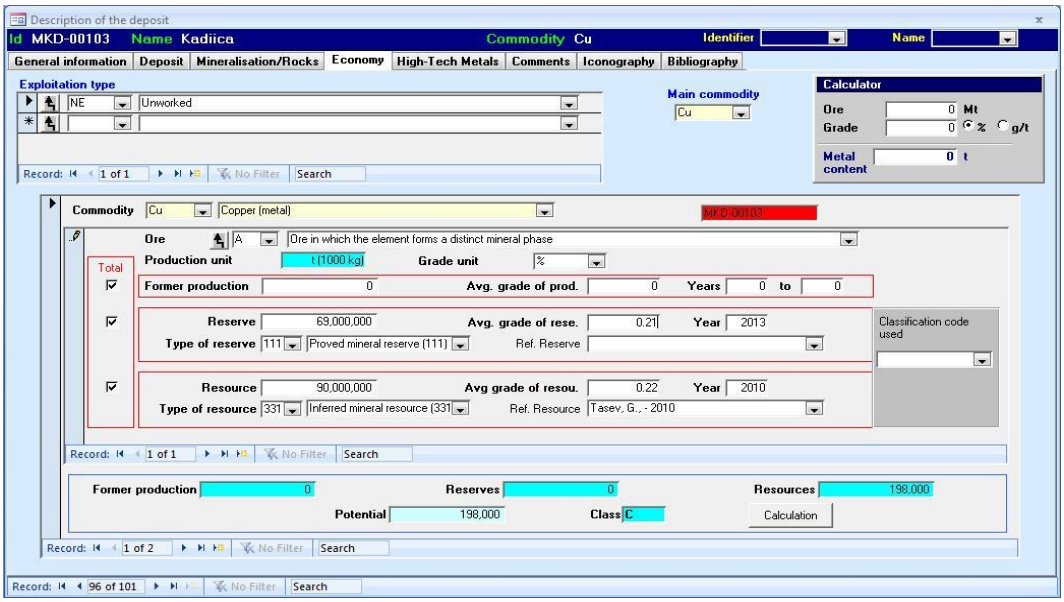

Fig. 4. Economy information datasheet of the database

So, here for the Kadiica deposit, was given information about the unworked status of exploitation type where the main commodity, Cu, is represented by secondary and rarely primary sulfide ore (complex sulfides, sulphosalts etc.). Also, reserves has been quoted as 0 t of former production, proved mineral reserves of 69 Mt (as of 2013 and copper concentration of 0.21% Cu) as well as measured mineral reserves of 90 Mt (as of 2010 and copper concentration of 0.22 % Cu) followed by data about four additional commodities (Pb, Zn) given as separate records within this datasheet (metal production, not the raw ore).

High-Tech Metals data sheet was divided into two different windows, which have been established in order to characterize (i) Potential of specific commodities or capacities (ii) where the anthropogenic products are processed. To characterize High-Tech metals, user has to enter a commodity (ex. Re, Se, Ga…), and then he will be able to give information about host minerals (e.g. molybdenite), grades (i.e. minimum, maximum and average grade) and abundance of host minerals in the ore. The right window give information about processing site(s) (e.g. concentrator, mill, smelter…). Due to relatively strong unworked nature of the Kadiica deposit (still at the prospect level), we haven't entered any additional data regarding this information sheet of the database.

Comments sheet, which is composed of two windows where it is possible to write free texts describing details about geology and/or details about economy of a particular deposit gives a fine opportunity to describe particular deposit in more details (Figure 5). Here we have entered extensive free text data about the detailed geological and mineralization features of the deposit, not mentioned elsewhere in the database (Figure 5).

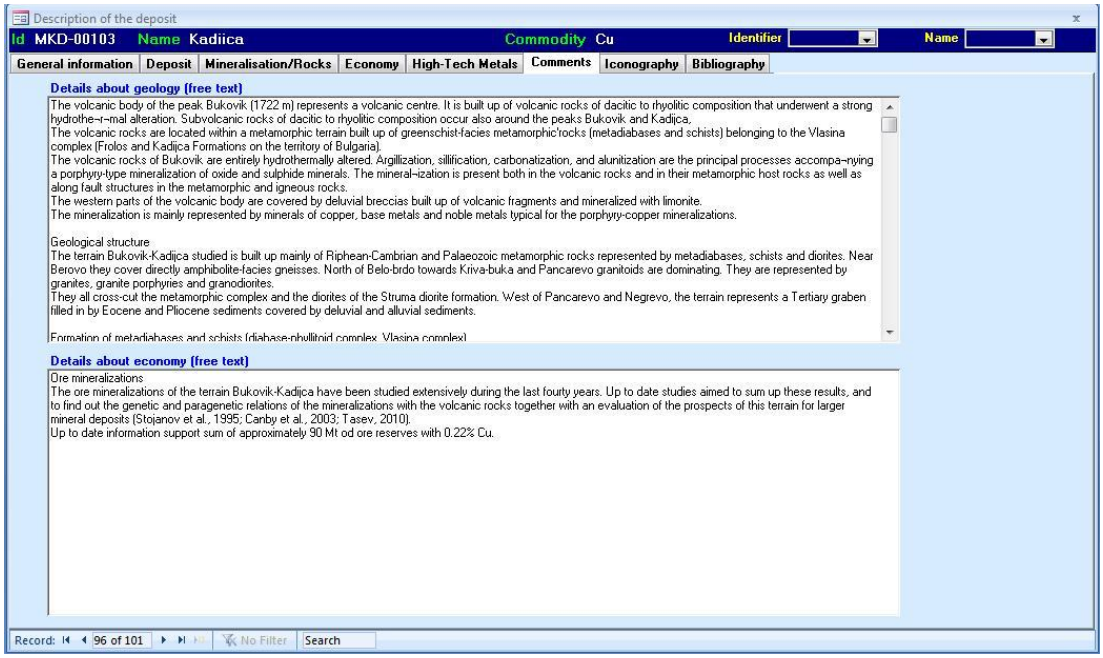

Fig. 5. Comments information datasheet of the database

Here in the upper window we accented that the ore deposit Kadiica is relatively new prospect with its specific geology. Also, here we stressed out that its metallogeny is related to tertiary calk-alkaline magmatism (predominantly Oligo-Pliocene) where mineralisation is in dacite comlex suite while ore bodies are mainly secondary

enrichment blankets. In the lower window were given some details on the economical aspect of the mine such were total reserves, excavated and remaining ones.

Iconography sheet has been elaborated in order to attach images with a deposit. The first step being definition of paths of the image directory and the image viewer (e.g. Photo Editor, Windows picture viewer, Picasa..) by clicking on "Configuration" button.

Bibliography data sheet for a particular deposits was intended to give an overview of geological bibliography (references relating to the geology of the deposit) and economical bibliography (references relating to economic data of the deposit) as can be seen at Figure 6.

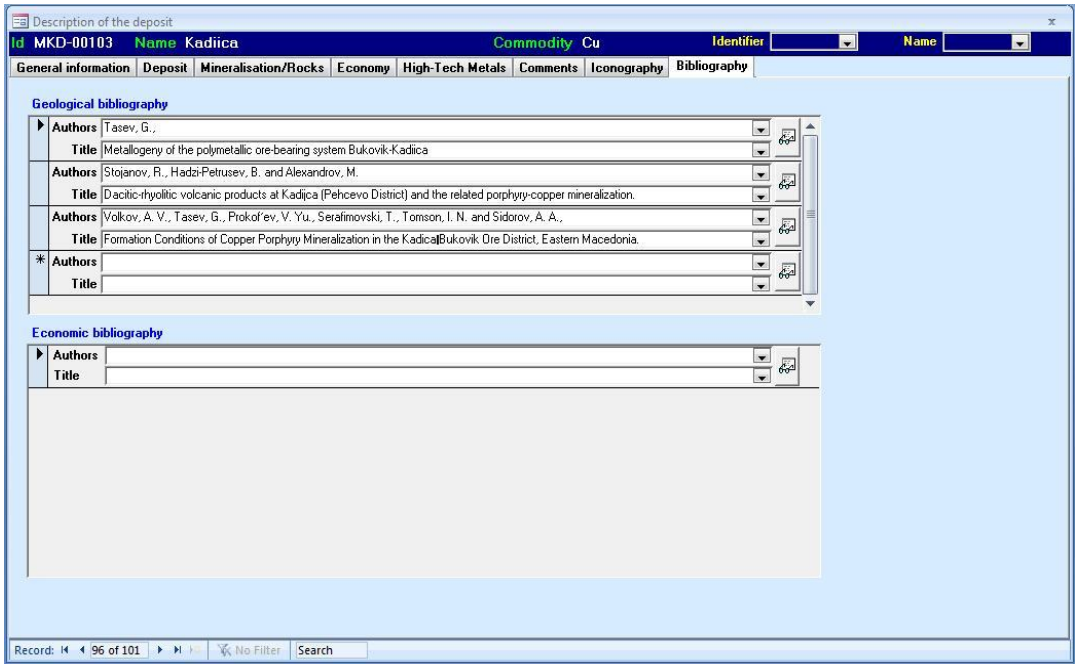

Fig. 6. Bibliography information datasheet of the database

For the Kadiica deposit, we made significant input in regards to both types of bibliography, geological and economical ones. All the known and commonly used references to this particular deposit have been covered in this data sheet.

CONCLUSION

The initial build of the Access database for the Kadiica Cu-mineral deposit had their major accents in the qualitative-quantitative parameters and natural indicators in function to present and future valorization of metals that were subject to the establishment of the database, in accordance with professional mineral databases, as well as economic viability of the particular ore elements in the near future bearing in mind the complex and variable nature of market and prices of copper concentration given in the particular Access database. The major findings and accents were that the Kadiica deposit is at the prospect level of exploration with certain porphyry copper potentials complemented by secondary Cu sulphide (cementation) morphology. Certain parts of the database showed the mineralization age of 15 Ma with host rock age around 26 Ma (K/Ar method) where the main host lithology consists of dacite, andesite, dacite–

andesite breccia and their varieties. From the economic point of view were accented proved mineral reserves of 69 Mt (with 0.21% Cu) as well as measured mineral reserves of 90 Mt (with 0.22 % Cu) while in the regards of metallogeny was stressed out that it is related to Tertiary calk-alkaline magmatism (predominantly Oligo-Pliocene).

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