Diversity of copper and gold deposits in the Eastern Europe Balkan, Carpathian and Rhodopean belts: tectonic, magmatic and geochronological investigations

SCOPES Project - Conference & Field Trip: Macedonia & Serbia

Organizers: A. von Quadt, T. Serafimovski, I. Peytcheva & V. Cvetkovic

May 29 - June 02, 2012 - Izgrev Hotel, Stip, Macedonia

Program, abstracts and field guide, edited by A. von Quadt & T. Serafimovski
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Content

Participant list of the workshop in Stip, May – June 2012

	First name	Name	Institution
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9	Joshua	Barcikowski	ETH Zurich
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15	Peter	Marchev	BAS - Geological Institute
16	Valentin	Grozdev	BAS - Geological Institute
17	Stoyan	Georgiev	BAS - Geological Institute
18	Elitsa	Stefanova	BAS - Geological Institute
19	Petyo	Filipov	BAS - Geological Institute
20	Rossitsa	Vassileva	BAS - Geological Institute
21	Zlatko	Peltekovski	University Goce Delcev, Stip
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25	Kristina	Saric	University Belgrade, Faculty of Mining and Geology
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43	John	Menzies	Cmi Capital Limited
44	Marian	Munteanu	Geological Institute of Romania
45	Gligor	Saveski	Atlas Copco AB
46	Dechev	Teo	Mundoro Capital Inc
47	Vasil	Andreev	
48	Dorin	Dordea	PROSPECTIUNI SA
49	Veselin	Kovachev	University Sofia
50	Osman	Kurtulus	
51	Dimitar	Tsotsorkov	Asarel
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53	Bahri	Yildiz	Stratex Madencilik San. Tic. Ltd. Şti
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55	Aleksandar	Pacevski	University Belgrade, Faculty of Mining and Geology
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"Diversity of copper and gold deposits in the Eastern Europe Balkan, Carpathian and Rhodopean belts: tectonic, magmatic and geochronological investigations".

	Name	Title	Affiliation	
0	Albrecht von Quadt	Opening	ETH Zurich	8.15 - 8.30
	Regional Geology			
1	Stefan Schmid	Correlation of tectonic units from the Alps to Western Turkey	ETH Zurich	8.30 - 9.00
2	Ioan Seghedi	Miocene-Quaternary basalts from East Carpathian volcanic chain, Romania: a mineral chemistry and melt inclusion study	Institute of Geodynamics of Romanian Academy, Bucharest	9.00 - 9.30
3	Sibila Borojevic Sostaric	Oligocene shoshonitic rocks of the Rogozna Mts. (Central Balkan Peninsula): evidence of petrogenetic links to the formation of Pb-Zn-Ag ore deposits	Faculty of Mining Geology, Zagreb	9.30 - 9.45
4	Kristina Saric	New LA-ICP-MS U/Pb zircon data on various granitoids from the European side of the Tethyan Mesozoic suture	Faculty of Mining and Geology, Belgrade	9.45 - 10.00
	Regional Metallogeny			
5	Todor Serafimovski	Major Alpine ore districts at the territory of the Republic of Macedonia	University "Goce Delcev"-Stip	10.00 - 10.30
6	Daniela Gallhofer	Geodynamics, geochronology and Cu-Au hydrothermal ore provinces in the Banat region and Apuseni mountains	ETH Zurich, IGP	10.30 - 11.00
	Coffee break			**11.00 - 11.30**
7	Alexsandar Pacevski	Skarn mineralizations in the Bor ore district: new evidence from study of bornite-chalcopyrite-hematite paragenesis	Faculty of Mining and Geology, Belgrade	11.30 - 11.45
	Environmental Geology			
8	Lazar Gjorgiev	Technogenous deposits and their environmental impact around the Buchim Mine	University "Goce Delcev"-Stip	11.45 - 12.00
9	Aneta Donkova-Petrushova	Au-Ag tellurides and other mineral associations in the Ilovitza Cu-Au deposit	University "Goce Delcev"-Stip	12.00 - 12.15
10	Dobriela Rogožareva	Some typical hydrothermal alterations in the Ilovitza Cu-deposit	University "Goce Delcev"-Stip	12.15 - 12.30
	Lunch			**12.30 - 14.00**
	Deposit Studies			
11	Elitsa Stefanova	Ilovitsa porphyry Cu-Au deposit: sequence of vein formation and sulfide deposition	BAS, Geological Institute, Sofia	14.00 -14.15
12	Zlatko Peltekovski	Principle metallogenic features of the Sasa Pb-Zn deposit, Republic of Macedonia	University "Goce Delcev"-Stip	14.15 - 14.30
13	Goran Tasev	New data of fluid inclusions study of the Kadiica deposit, Republic of Macedonia	University "Goce Delcev"-Stip	14.30 - 14.45
14	Violeta Stefanova	Placer gold prospecting around the Tertiary occurrences in the Republic of Macedonia	University "Goce Delcev"-Stip	14.45 - 15.00
15	Rossitza Vassileva	Compositional characteristics of sulphide mineralization from the hydrothermal Madan Pb-Zn deposits: a LA-ICP-MS study	BAS, Geological Institute, Sofia	15.00 - 15.15

16	Atanas Hikov	Rare earth element mobility during advanced argillic alteration in Assarel porphyry copper deposit, Central Srednogorie, Bulgaria	Elatsite Mine	15.15 - 15.30
Magmatism				
16	Joshua Barcikowski	Magmatic evolution of the Buchim-Damjan-Borov Dol ore district - Petrology-geochemistry	ETH Zurich	15.30 - 15.45
17	Stephan Lehmann	Magmatic evolution of the Buchim-Damjan-Borov Dol ore district- Geochronology-source material	ETH Zurich	15.45 -16.00
	Coffee break			**16.00 - 16.30**
18	Milorad Antic	More than 500 Ma of magmatic and tectonic evolution of the Serbo-Macedonian Massif (south Serbia, southwest Bulgaria and east Macedonia)	University of Basel	16.30 - 16.45
19	Stela Atanasova	Magma Interaction Recorded in Amphiboles from Vitosha pluton, Western Srednogorie, Bulgaria"	BAS, Geological Institute, Sofia	16.45 - 17.00
20	Petyo Filipov	Preliminary Data on the Age and Geochemistry of Mesta Volcanic Complex and Central Pirin Pluton	BAS, Geological Institute, Sofia	17.00 - 17.15
21	Stoyan Georgiev	Transect trough the Cenozoic magmatism in WSW Bulgaria and Macedonia from Pirin Mountain to Kozhuf: temporal and isotope-geochemistry constraints	BAS, Geological Institute, Sofia	17.15 - 17.30
22	Valentin Grozdev	U-Pb zircon dating and zircon population analyses of the Paleogene magmatic rocks in Kyustendil and Kratovo area.	BAS, Geological Institute, Sofia	17.30 - 17.45

Principle metallogenic features of the Sasa Pb-Zn deposit, Republic of Macedonia

Zlatko Peltekovski[1], Todor Serafimovski[2] and Goran Tasev[2]

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[2]*Faculty of Natural and Technical Sciences, University "Goce Delcev"-Stip, Republic of Macedonia*

The Sasa Pb-Zn deposit has been localized in northeastern parts of the Republic of Macedonia or within the Serbo-Macedonian metallogenetic province. It formation is related with intrusion of Tertiary volcanics (27-24 Ma) into the crystalline fundament (Precambrian gneisses and Paleozoic schists) of the Serbo-Macedonian massif. Pb-Zn mineralization metasomathicaly is deposited into cipolins intercalated into the series of quartz-graphite schist. Genesis and spatial displacement of the Pb-Zn mineralization in the Sasa deposits represents a complex polyphase and timely lasting process directly related with the evolution of the Neogene magmatism and hydrothermal solutions in the deposits and its adjacent vicinity (Serafimovski and Aleksandrov, 1995). Magmatic activity started at the end of Eocene and lasted, through few phases, until the Pliocene. The mineralization is formed through several phases during Oligocene-Miocene. The ore mineralization spatially and genetically is related to the fault structures of NNW-SSE, NW-SE direction dipping to SW and its intersections with N-S structures dipping to the west, localized mainly in cipolins-marbles, cipolin-schists within quartz-graphite schists in zones of cataclization (in quartz-graphite schists, gneiss and rarely quartzlatites). Ore-bearing fault structures are of polygene character and its formation is directly related to reactivation of older fault dislocations, regional tectonic tensions under the influence of Neogene magmatic activities, while in the dykes was included influence of contractions due to their cooling.

Mineralization in the deposit is generated as a result of common action of numerous synhronous and consecutive factors that allowed deposit genesis, such are: host rocks conductive to change, grinding-brecciation-abrassion, which have created zones with an increased secondary porosity, intrusion of fluids (gaseous-liquid), common reaction between fluids and adjacent rocks, metasomathosis (thermal change-marlbeization and changes with componenet transfer), formation of calcic skarns (multiple skarn parageneses) and hydrothermal alterations: intermineralizing movements, mineralization-its deposition (polyphase), inter-ore movements and post-ore tectonics.

Genesis of the Svinja Reka deposit (as a synonym of Sasa deposit) was done in three separate phases of which especially is important the skarn phase when have been created condition for deposition of the Pb-Zn mineralization within the hydrothermal stage with additional three phases and few sub-phases (Aleksandrov, 1992). The mineralization has been deposited metasomathically in calcite skarns or by filling of cracks, brecciated zones and faults. In particular parts have been formed impregnation and stockwork-impregnation minerals as a products of polycentric metasomathic processes. The ore bodies have forms of pseudo-layers (tile-like), lenses, layers, oblique ore pillars, followed by impregnation and stockwork-impregnation mineralization in hangingwall and footwall of the ore bodies

Lead-zinc mineralization has been formed in the hydrothermal stage, which have started with manifestation of high-temperature pre-ore alterations of adjacent rocks (skarns), represented by intensive epidotization, chloritization, pyritization, silicification, calcitization that a little bit later continues into first high-temperature ore-bearing sulfide phase. Within that phase have been formed pentlantdite, pyrhotite, pyrite, chalcopyrite, bereite, bismuthinite, native bismuth, sphalerite, occasionally galena, bornite, arsenopyrite, hematite, siderite, quartz and clacite. Ore minerals were formed in the temperature range of 400-280^{o}C with simultaneous crystalization of colloidal dispersed solutions. With change of regime of ore-bearing solutions or decrease of temperature (interval of 375-220^{o}C), steep decline of pressure and increase of redox potential, results in deposition of ore minerals from main sulphide phase within hydrothermal stage. In this phase intensively are deposited sphalerite and galena, then chalcopyrite, pyrite, cubanite, valerite, bornite, tennantite, tetrahedrite, freibergite, enargite, altaite etc. With fluid inclusions analyses (in quartz) it was confirmed that this paragenesis was characterized by ore solutions with ph of 6.7 and following composition: 37.42 g/l Cl, 0.57 g/l F, 11.26 g/l SO^{2}_{4}, 11.90 g/l K, 10.68 g/l Na, 0.59 g/l NH_4, 0.46 g/l Mg, 5.24 g/l Ca, SiO-trace and B-trace. This points out that there dominated Ca and Na chlorides, which concentration could easily reach up to 65,00 g/l.

Effusive rocks quite often fill-up the cracks, faults and fualting structures with lower degree of resistivity. The contact parts between effusive and adjacent rocks are usually poorly mineralized, which is probably due to hydrothermal alterations.

The results from up to date numerous studies are pointing out to the fact that the Svinja Reka deposit has been formed at sub-volcanic level, while by the formation conditions it could easily be accounted into the group of skarn-hydrothermal-polymetallic deposits of metasomathic type.

Reference:

Aleksandrov, M., 1992. Metallogenetic features of the polymetalic ore field Sasa-Eastern Macedonia. Doctoral thesis, Faculty of Mining and Geology, Stip, 264 p. (in Macedonian)

Serafimovski, T and Aleksandrov, M., 1995. Lead and zinc deposits and occurrences in the Republic of Macedonia. Special edition of RGF, Stip. No 4, 387 p. (in Macedonian with extended summary in English).