

# 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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**ETH**

Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich



Geological Institute  
BAS - Sofia



University "Goce Delcev"-Stip



University of Belgrade

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- Geographic map (Sofia – Elatsite)
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- **Excursion** to Alshar mineralization (border region Macedonia – Greece) – 01.06.2012
- **Excursion** to Buchim porphyry deposit – 02.06.2012

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

	First name	Name	Institution
1	Todor	Serafimovski	University Goce Delcev, Stip
2	Goran	Tasev	University Goce Delcev, Stip
3	Dobriela	Rogozareva	University Goce Delcev, Stip
4	Aneta	Donkova-Petrushova	University Goce Delcev, Stip
5	Lazar	Georgiev	University Goce Delcev, Stip
6	Violeta	Stefanova	University Goce Delcev, Stip
7	Albrecht	von Quadt	ETH Zurich
8	Stephan	Lehmann	ETH Zurich
9	Joshua	Barcikowski	ETH Zurich
10	Daniela	Gallhofer	ETH Zurich
11	Milorad	Antic	Uni Basel
12	Stefan	Schmid	ETH Zurich
13	Nino	Seghedi	Romanian Academy-Institute of Geodynamics
14	Irena	Peytcheva	BAS - Geological Institute
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
22	Atanas	Hikov	BAS - Geological Institute
23	Valdica	Cvetkovic	University Belgrade, Faculty of Mining and Geology
24	Aleksandar	Pacevski	University Belgrade, Faculty of Mining and Geology
25	Kristina	Saric	University Belgrade, Faculty of Mining and Geology
26	Suzanna	Eric	University Belgrade, Faculty of Mining and Geology
27	Miodrag	Banjesevic	
28	Masa	Radivojevic	University Belgrade, Faculty of Mining and Geology
29	Aleksandar	Miskovic	University of British Columbia, Vancouver
30	Craig	Hart	Department of Earth & Ocean Sciences
31	Bojan	Djordjevic	Avala Resources DOO
32	Sinisa	Glisic	Avala Resources DOO
33	Sibila	Borojevic Sostaric	University Zagreb
34	Dejan	Kozelj	South Danube Metals DOO Beograd
35	Stela	Anatasova	BAS
36	Bayram	Artun	Teck Cominco Limited
37	Daniela	Bombol	EurOmax Macedonia DOOEL Skopje
38	Mihaela-Elena	Cioaca	Geological Institute of Romania
39	Saygun	Keles	Teck Cominco Limited

40	Yassen	Khrishev	Empire Mining Corporation
41	Kemal	Kurcan	Teck Cominco Limited
42	Georgi	Magaranov	Mundoro Capital Inc
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
52	Ahmet	Tukac	
53	Bahri	Yildiz	Stratex Madencilik San. Tic. Ltd. Şti
54	Trajca	Toncic	Mining and Metallurgical Company
55	Aleksandar	Pacevski	University Belgrade, Faculty of Mining and Geology
56	Nadka Bozhkova	Vasileva	Ellatzite Mine
57	Zheyazko Hristo	Yalamov	Ellatzite Mine
58	Aurelien	Rombaut	
59		Driver	

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May 29 - June 02, 2012

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

Name	Title	Affiliation	
<b>0</b> Albrecht von Quadt	Opening	ETH Zurich	8.15 - 8.30
<b>Regional Geology</b>			
<b>1</b> Stefan Schmid	Correlation of tectonic units from the Alps to Western Turkey	ETH Zurich	8.30 - 9.00
<b>2</b> 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
<b>3</b> 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
<b>4</b> 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
<b>Regional Metallogeny</b>			
<b>5</b> Todor Serafimovski	Major Alpine ore districts at the territory of the Republic of Macedonia	University "Goce Delcev"-Stip	10.00 - 10.30
<b>6</b> Daniela Gallhofer	Geodynamics, geochronology and Cu-Au hydrothermal ore provinces in the Banat region and Apuseni mountains	ETH Zurich, IGP	10.30 - 11.00
<b>Coffee break</b>			<b>11.00 - 11.30</b>
<b>7</b> Aleksandar 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
<b>Environmental Geology</b>			
<b>8</b> Lazar Gjorgiev	Technogenous deposits and their environmental impact around the Buchim Mine	University "Goce Delcev"-Stip	11.45 - 12.00
<b>9</b> Aneta Donkova-Petrushova	Au-Ag tellurides and other mineral associations in the Ilovitza Cu-Au deposit	University "Goce Delcev"-Stip	12.00 - 12.15
<b>10</b> Dobriela Rogožareva	Some typical hydrothermal alterations in the Ilovitza Cu-deposit	University "Goce Delcev"-Stip	12.15 - 12.30
<b>Lunch</b>			<b>12.30 - 14.00</b>
<b>Deposit Studies</b>			
<b>11</b> Elitsa Stefanova	Ilovitza porphyry Cu-Au deposit: sequence of vein formation and sulfide deposition	BAS, Geological Institute, Sofia	14.00 - 14.15
<b>12</b> Zlatko Peltekovski	Principle metallogenic features of the Sasa Pb-Zn deposit, Republic of Macedonia	University "Goce Delcev"-Stip	14.15 - 14.30
<b>13</b> Goran Tasev	New data of fluid inclusions study of the Kadiica deposit, Republic of Macedonia	University "Goce Delcev"-Stip	14.30 - 14.45
<b>14</b> Violeta Stefanova	Placer gold prospecting around the Tertiary occurrences in the Republic of Macedonia	University "Goce Delcev"-Stip	14.45 - 15.00
<b>15</b> 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 Srednogie, Bulgaria	Elatsite Mine	15.15 - 15.30
<b>Magmatism</b>				
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
	<b>Coffee break</b>			<b>16.00 - 16.30</b>
	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	
18	Stela Atanasova	Magma Interaction Recorded in Amphiboles from Vitosha pluton, Western Srednogie, Bulgaria”	BAS, Geological Institute, Sofia	16.30 - 16.45
19	Petyo Filipov	Preliminary Data on the Age and Geochemistry of Mesta Volcanic Complex and Central Pirin Pluton	BAS, Geological Institute, Sofia	16.45 - 17.00
20	Stoyan Georgiev	Transect through the Cenozoic magmatism in WSW Bulgaria and Macedonia from Pirin Mountain to Kozhuf: temporal and isotope-geochemistry constraints	BAS, Geological Institute, Sofia	17.00 - 17.15
21	Valentin Grozdev	U-Pb zircon dating and zircon population analyses of the Paleogene magmatic rocks in Kyustendil and Kratovo area.	BAS, Geological Institute, Sofia	17.15 - 17.30
22				17.30 - 17.45

# Technogenic deposits in the mine Bucim and their potential economic and ecological effects

Lazar Georgiev<sup>1</sup> and Todor Serafimovski<sup>2</sup>

<sup>1</sup>DPTU "Buchim" DOOEL Radovis, R. Macedonia

<sup>2</sup>Faculty of natural and technical sciences, University Goce Delcev

The mine for copper and gold Bucim is in exploitation since 1979<sup>th</sup>, with a temporary closing in the years 2003-2004. The annual production is around 4.000.000 t ore and 4.500.000 t ore dumping. From this amount of sulfide ore a copper concentrate is gained that amounts 30.000 t, the rest is flotation dumping.

The accumulated ore dumping from 120.000.000 t in the waste rock dump no. 1 with an average content of copper of 0.080% and the accumulation flotation dumping of around 80.000.000 t in the hydro dumping "Topolnica" with an average content of 0.040% Cu, < 0.3 g/t Au, present significant technogene findings and in this work an effort has been made to define their economical productivity and ecological effects on the environment (Serafimovski et al., 2011). The valorization of the copper from the sulfide mine dumping in the waste rock dump no. 1 with the help the hydrometallurgical process with a method of leaching, enables solving the ecology problem with the mining water which drain in the waste rock dump, and at the same time an additional annual production of 2.800 t cathode copper will be added in technological complex for reproduction of the solutions rich with copper located under the postponement no. 1 of the mine Bucim.

From the up to date studies on the flotation tailing dump "Topolnica" it is stated that secondary enrichments of gold appear in some levels, where the content is in the frame of 0.1 - 0.7 g/t. The rhythmical separation of the levels rich with gold is a result of cyclic processing of ore with different content of gold. From the phase analysis turns out that the gold can be found in the pyrite, the rest of the chalcopyrite, and it can also be found as natural small grained disperse, included in the free silica. In the frames of this work results and findings from the performed researches for determining the pollution with heavy metals around the technogene deposits in the mine Bucim are also given, as well as strategies for solving the problems with the pollution. After the analyses and the interpretation of the data the assumptions for increased values of the following heavy metals were confirmed: Cu, Fe, Zn, Pb, Mn, Cd, As and Co. because the mine Bucim is a mine for exploitation of copper, the results of Cu were especially interesting and which reached values of 0.01-704.7 mg/l in the water, 17.8-1734 mg/kg in the soil, 2854 mg/kg in a collective sample of green algae from the Bucim lake and its leak, 55-875 mg/kg in the roots and young branches of acacia. The increased concentration of metal was determined in all the analyzed mediums: water, soil and plants. The increased concentrations of metals are often several times higher than maximum allowed standards.

The increasing of Cu in the water samples is very distinctive nearby the waste rock dump no. 1, today with the beginning of the work of the plant for producing cathode copper that problem with the drainage mining water is solved (). The concentration of the metals in the soil is highest in the surrounding area of the waste rock dump no. 1 and the flotation hydro dumping "Topolnica". This work is focused on the transfer factor (TF) for the system technogene soil-plant in the flotation tailing dump "Topolnica". The plant acacia (lat. *Robina Pseudoacacia*) which is used for biological reclamation of the dam of the hydro damping and the nearby surrounding of the mine Bucim has a transfer factor that surmounts the hyper accumulation criterion > 1 for Mo (TF = 1.54 – 3.56).

## Reference:

- Serafimovski, T., Mihajlov, M., Siderovski, K., Tasev, G. and Konzulov, G., 2011. Anthropogenic influence of the Buchim mine waste dump and hydrotailing to the surface and ground waters in the Lakavica basin, Macedonia. Proceedings of the 1<sup>st</sup> Workshop on the UNESCO-IGCP Project "Anthropogenic effects on the human environment in the Neogene basins in the SE Europe", Eds. T. Serafimovski & B. Boev, pp. 39-52.
- Lottermoser BG, 2010: Mine Wastes: Characterization, Treatment and Environmental Impacts. 3rd edition. Springer-Verlag, Berlin Heidelberg, 400 pp.