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Original scientific paper

MINERALOGICAL-CHEMICAL CHARACTERISTICS OF CALCITE FROM ZLETOVO, SASA AND BUČIM DEPOSITS

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A b s t r a c t: The paper presents mineralogical-chemical characteristics, dependence between some elements and concentration of some calcite elements of Zletovo, Sasa and Bučim deposits. Calcite from Sasa, Zletovo and Bučim occurs in rombohedral crystals of different size. The colour is white, but in Bučim it is white, pink, and yellow. Their twinning is very common. Chemical composition of calcite was determined by AES–ICP. Results show that in calcite from Bučim the concentration of Ba is much higher in pink calcite from than in white or yellow. The concentration of Zn and Pb is the lowest in white calcite. The calcite from Zletovo contains much higher concentrations of Pb, Zn, Sr, but calcite of Bučim which is pink contains higher amounts of Ba and Co. The concentrations of CaO, MgO, and MnO in all calcite simples are approximately equal. Concentration of all other elements in calcite of Sasa, Zletovo and Bučim is approximately equal. TG and DTA curves out on all simples were recorded.The decompositions of the samples of calcite starts at different temperature and it is not finish until 1000 °C.

Key words: calcite; crystal; colour; clevage; thermal analysis

INTRODUCTION

The present of calcite in the Zletovo and Sasa lead zinc deposites as well as in the Bučim copper deposite is mentioned in several papers such as [1], [2], [3], [5], [6], [7].

The mineralogical-chemical characteristics of the calcite from these deposits have not been determined so far. In the papers mentioned above, only ore minerals have been analyzed.

In the Sasa ore field, especially in the Svinja River, calcite is the most important of all non-ore minerals. It was occurs together with dolomite, rhodochrozite, siderite, barite, quartz, calcedon, opal and so on.

Calcite in Zletovo formed in the final phases of the hydrothermal stage.

Hydrothermal mineralization stage commenced with a manifestation of high temperature pre-ore alterations of surrounding volcanic rocks present as chloritizations, epidotizations, pyritizations, in part calcitization, silifications and terminates with separation of low temperature oxide carbonate paragenesis present as calcite, siderite, rhodochrozite, quartz, chalcedon and opal.

In the Bučim ore field calcite formed in hydrothermal stage. It occurs together with feldspar, biotite, chlorite, muscovite, sericite, epidot, quartz. Very often is found as smaller and larger net-like concentrations.

EXPERIMENTAL PART

Concentration of elements determined were made using Liberty 220 ICP–AES (Varian, Australia) at optimized conditions. Lost of ignation were made using thermal furnace Nabertherm in the temperature 1100°C.

TG and DTA curves were obtained by using a Netzch thermoanalyser in dry air in the temperature range 20–1000°C, at a heating rate of 10° min^{-1}. All solutes used for preparing the calibration curve for the elements determined, were made with diluting

of multielement standard solution (CertiPUR, ICP–multi–element standard solution IV, Merck, Germany), which contains 23 elements in disolved nitric acid the concentration being 1000 mg/l. For preparing the calibration curve of As, solutes were used obtained by dilution of the basic standard solute (Titrisol, As_2O_3 in H_2O, 1000 mg/l, Merck, Germany).

All standard solutes and those of sam studied are acidified with 5% nitric acid.

0.5 of the sample studied is weighted in volu ric flask and 20 ml HNO_3 (1 : 1) is added. The ture is left overnight. The following day it is wa on electric heater at 1500 °C to wet salts. 5 ml centrated nitric acid is added to the volum flask and filled with 100 mg/l redistill water.

RESULTS AND DISCUSSION

Calcite from Sasa ore field occurs in good rhombohedral crystals of different sizes. The colour is white. Cleavage is perfect on (1011). Interference colours are white and of higher order. Nm = 1.658, Np = 1.486, $Nm - Np$ = 0.172. [4]. Optically is negative.

Calcite from Zletovo occurs in good rhombohedral translucent crystals. The colour is white. Cleavage is perfect on (1011), hardness 3, density 2.71 g/cm^3.

Calcite from Bučim occurs in rhomohe crystals. The colour is white, but in Čukar II part 555/579 it is white, yellow and pink. Size crystals is small. Their twinning is very commo

Proportional depends between some eleme are shown on Figs. 1–6.

Table 1

Chemistry of calcite from Sasa and Zletovo

	Sasa – Svinja River hor. XII k. 1318	Sasa – Svinja River hor. XV k.1190 900–900'	Sasa – Svinja River hor. XIII k. 1254 p. 1000–1000'	Zletovo vein 1B, hor. 4 pot.2 etage II 2–46
CaO	54.67	53.68	53.02	53.47
MgO	0.03	0.086	0.11	0.22
MnO	1.13	2.77	2.87	1.35
FeO	0.05	0.10	0.16	1.39
Lost of ignation CaO	42.89	42.11	41.60	41.95
Lost of ignation MgO	0.03	0.09	0.12	0.24
Lost of ignation MnO	0.70	1.72	1.78	0.84
Lost of ignation FeO	0.03	0.06	0.10	0.85
Total	**99.54**	**100.62**	**99.73**	**100.30**
Sr	49.84	78.55	110.76	537.86
Ba	10.67	27.37	10.59	15.23
Zn	<1.66	2.33	1.44	139.98
Pb	2.189	6.09	12.85	1030.73
Ag	1.84	4.05	4.33	3.23
Au	0.92	1.86	6.76	1.53
Na	57.38	55.40	36.22	30.90
K	100.01	98.44	90.60	97.32
Al	65.42	65.43	67.79	61.47
P	5.91	0.55	4.06	3.42
Cd	0.09	<0.07	<0.07	3.41
Cu	0.25	<0.2	0.47	0.27
Ni	<0.49	<0.49	<0.49	<0.49
Cr	<0.13	0.88	<0.13	<0.13
Co	<0.27	<0.27	<0.27	<0.26
Li	1.15	0.76	0.56	1.16
V	3.00	7.88	8.30	5.38
Mo	<6.00	<6.004	<6.004	<6.00
W	<0.23	<0.23	<0.23	<0.23
Ti	<0.043	<0.04	<0.04	<0.043
Se	<7.43	7.58	9.12	<7.43
As	<1.85	<1.85	8.69	11.92

Table 2

Chemistry of calcite from Bučim

	Central body 540/333 c-71 white	Čukar II west part 555/579 pink	Čukar II west part 555/579 yellow
CaO	55.35	46.27	50.27
MgO	0.03	4.22	2.85
MnO	0.27	1.09	0.38
FeO	0.21	5.41	3.62
Lost of ignation. CaO	43.43	36.30	39.44
Lost of ignation MgO	0.03	4.60	3.11
Lost of ignation MnO	0.17	0.67	0.23
Lost of ignation FeO	0.13	3.31	2.22
Total	99.62	101.88	102.13
Sr	94.03	105.22	109.32
Ba	13.54	568.55	0.10
Zn	2.28	45.08	28.41
Pb	2.83	26.97	24.06
Ag	0.62	0.54	<0.60
Au	6.88	3.96	<0.320
Na	<1.68	31.33	45.00
K	95.54	113.39	38.40
Al	70.34	1.57	26.90
P	16.26	14.32	21.88
Cd	0.37	2.34	3.42
Cu	7.99	1.44	1.33
Ni	0.84	<0.49	<0.49
Cr	0.52	<0.13	<0.13
Co	<0.27	0.70	<0.27
Li	0.63	1.15	1.48
V	<0.45	21.49	6.14
Mo	<6.00	<6.00	<6.00
W	<0.23	<0.23	<0.23
Ti	<0.04	0.09	<0.04
Se	<7.43	<7.43	<7.43
As	<1.85	<1.85	<1.85

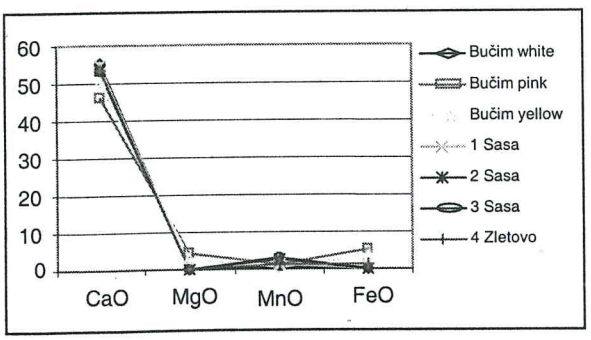

Fig. 1. Proportional depends between CaO, MgO, MnO, FeO

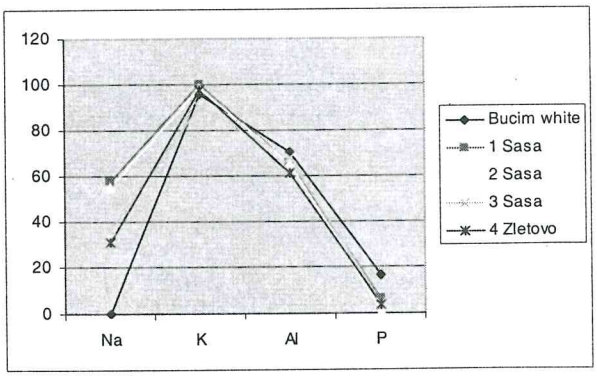

Fig. 2. Proportional depends between Na, K, Al, P

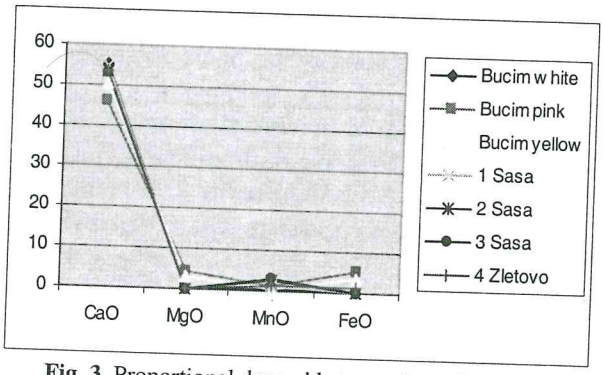

Fig. 3. Proportional depend between lost of ignation CaO, MgO, MnO, FeO

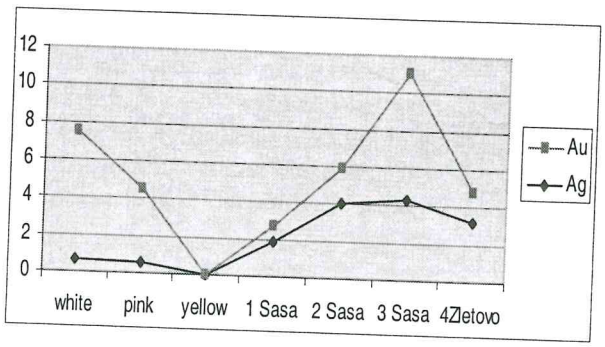

Fig. 4. Proportional depends between Au and Ag

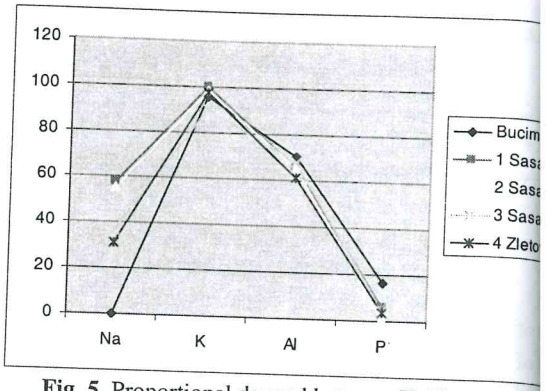

Fig. 5. Proportional depend between K, Na, Al and

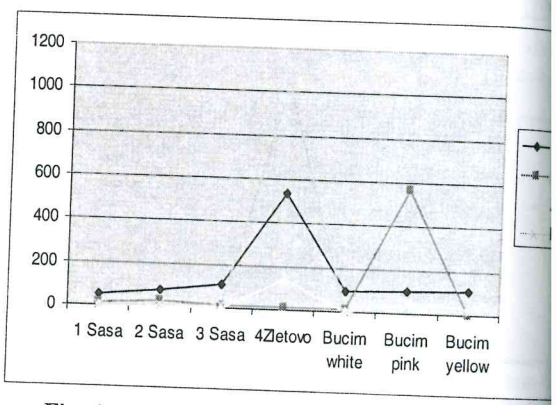

Fig. 6. Proportional depend between Sr, Ba, Pb, Zn

Thermal decomposition of the calcites

DTA, TGA curves show the decompositions of the all samples of calcite starts at different temperature and it is not finish until 1000 °C.

Thermal decomposition of the calcite from Bučim (pink) becomes at about 510 °C followed by two endothermic peaks, the first once at 770 °C, and the second at about 930 °C. The thermal decomposition of calcite from Bučim (yellow) b comes at 670 °C and takes place also in two ste One endothermic peak appears at 750 °C, and t other at about 958 °C.

The thermal decomposition of calcite fro Sasa is at720 °C. The sample decompose in the o steps to 1000 °C, followed with endothermic peal at about 1000 °C, and at 975 °C appropriatel

CONCLUSION

Our investigation shows proportional dependence between:

– CaO, MgO, MnO, and FeO,

– Na, K, Al, and P except in yellow and pink calcite from Bučim,

– Au and Ag in all samples,

– Sr, Ba, Pb and Zn in all samples.

Concentration of Ba is much higher in pin calcite from Bučim but the concentration of Pb i much higher in calcite from Zletovo. Concentra tion of Co is much higher in pink calcite fro Bučim. Losses in ignition with all samples is ap proximately equal.

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Резиме

МИНЕРАЛОШКО–ХЕМИСКИ КАРАКТЕРИСТИКИ НА КАЛЦИТОТ ОД НАОЃАЛИШТАТА ЗЛЕТОВО, САСА И БУЧИМ

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Клучни зборови: калцит; кристал; цепливост; боја; термална анализа

Во овој труд се презентирани минералошко-хемиските карактеристики на калцитот од Злетово, Саса и Бучим како и, зависноста меѓу одделните елементи и нивната концентрација.

Калцитот од Злетово, Саса и Бучим се јавува во ромбоедарски кристали со различна големина. По боја е бел, но во Бучим се јавува и како розов и жолт. Испитувањата покажаа дека кај калцитот од Бучим концентрацијата на Ba е многу повисока во розовиот отколку во белиот и жолтиот. Концентрацијата на Zn и Pb е повисока во белиот калцит.

Најголема концентрација на Sr, Pb и Zn има во калцитот од Злетово, додека кај розовиот калцит од Бучим најголема е концентрацијата на Ba и Co. Концентрацијата на CaO, MgO и MnO, како и загубите при жарење во сите примероци се речиси идентични.

Пропорционална зависност е констатирана меѓу:
– CaO, MgO, MnO, и FeO,
– Na, K, Al и P, освен во жолтиот и розовиот калцит од Бучим,
– Au и Ag,
– Sr, Ba, Pb и Zn.