

## SULFUR FROM THE STARI TRG MINE, KOSOVO

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Sphalerite, pyrite, bournonite, boulangerite, anglesite and sulfur were determined on one sample of the ore deposit of Stari Trg mine, kept in collection of Department of Mineralogy and Petrography, Croatian Natural History Museum. Relation of the deposition of found minerals was determined. Sulfur was deposited as a fine powder coatings and as a small crystals, and originated from the oxidation of sulfide minerals. Crystal morphology was measured on the sulfur (shown on Figs. 1 and 2). Unit cell dimensions were calculated on the basis of X-ray powder diffraction pattern.

**Key words:** Sulfur, crystal morphology, Stari Trg

Na uzorku iz rudnog ležišta Stari Trg, pohranjenom u zbirci Mineraloško-petrografskog odjela Hrvatskoga prirodoslovnog muzeja konstatirani su sfalerit, pirit, bournonit, boulangerit, anglezit i sumpor. Utvrđeni su genetski odnosi među mineralima iz parageneze. Sumpor je odložen u obliku praškastih prevlaka i kristalića, a postanak mu je vezan uz oksidacijske procese kojima su zahvaćeni sulfidni minerali. Na kristalima sumpora određena je morfologija i prikazana na slikama 1 i 2. Izračunati su parametri jedinične ćelije sumpora.

**Ključne riječi:** sumpor, morfologija kristala, Stari Trg

## EXPERIMENTAL CONDITIONS

Mineral identification in paragenesis was performed by the X-ray powder method. A graphite monochromator was used for the monochromatization of Cu  $K_{\alpha}$  radiation. The standard conditions was  $1^{\circ}2\theta/\text{min}$  for the counter and  $1 \text{ cm}/\text{min}$  for the paper. Identification of the X-rays diffraction

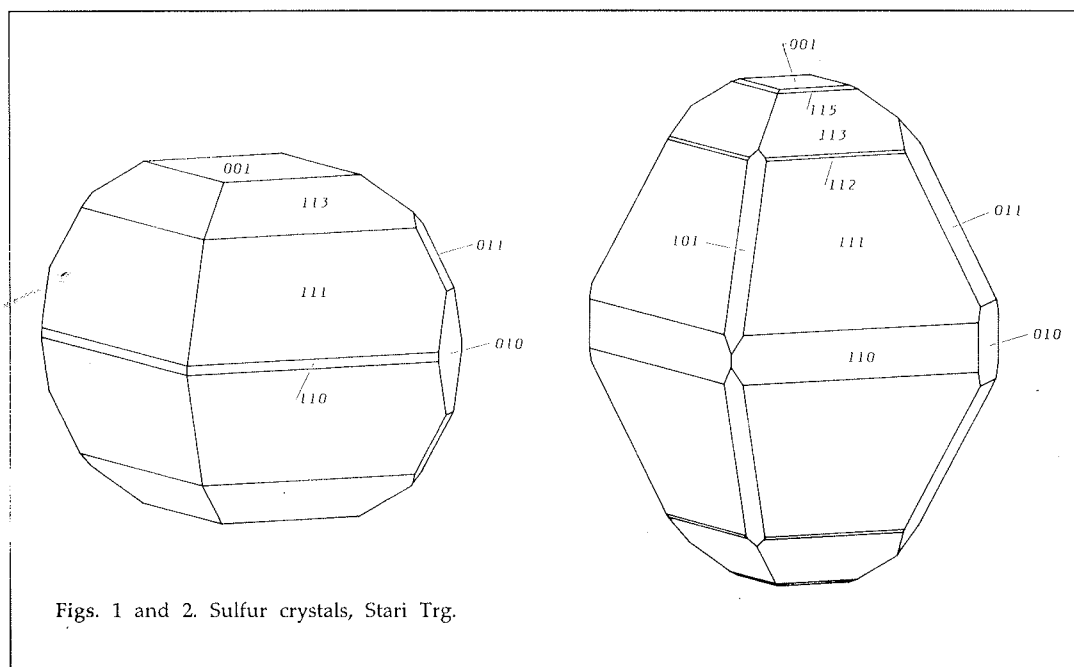
pattern was performed by the MPDS computer program (HUMMEL, 1988). The sulfur X-ray diffraction pattern was indexed conformably to JCPDS card no. 8-247. Calculation of the unit cell was performed by the GITTER computer program (HUMMEL, 1982). Goniometric measurement of sulfur crystals was performed on the Goldschmidt goniometre, model A. The

crystal faces were determined on the basis of axial ratio  $a:b:c=0.811:1:1.900$  which other authors also give for orthorhombic sulfur (PALACHE et al., 1952; GOLDSCHMIDT, 1897).

## RESULTS

The earliest mineral in the paragenesis is sphalerite, followed by pyrite. Later minerals are bournonite

and boulangerite. Boulangerite is deposited to look like a skin. Anglesite shows botryoidal light grey crusts partly covering earlier sphalerite. Sulfur appears in small crystals and earthy coatings over all the earlier minerals, especially the bournonite and the anglesite. The sulfur crystals reach at least 1 mm in size, most commonly they have just 0.25 mm. They are clear, yellowish and have shiny faces.



Figs. 1 and 2. Sulfur crystals, Stari Trg.

and boulangerite. The sphalerite crystals are up to 5 cm in size and are typical for the Stari Trg mine. They are usually polysynthetic twins on {111}. Small pyrite crystals are usually striated hexahedrons. Bournonite crystallized in the later stage of the sphalerite crystallization and shows typical habit - short columnar twins similar to a cogwheel. Unusually short fibrous crystals of the

The faces of the following forms: {001}, {010}, {110}, {011}, {101}, {111}, {112}, {113} and {115} were measured by the goniometre of four crystals. Two types of crystals can be found in the druse: typically they are dipyramidal and more rarely barrel-like, as shown on Figures 1 and 2. The powder X-ray diffraction pattern was used to calculate the unit cell dimensions of sulfur  $a_0=10.450(4)\text{\AA}$ ,

$b_0 = 12.864(6)\text{\AA}$ ,  $c_0 = 24.411(11)\text{\AA}$ . The sulfur crust on the sphalerite, pyrite, bournonite and anglesite are obviously connected with oxidation processes in sulfide minerals. This oxidation can be especially well seen on the sphalerite, pyrite and bournonite.

#### CONCLUSION

The Stari Trg ore deposit is world famous for its beautiful crystals and its long list of minerals in paragenesis (about seventy). To these number we add another mineral - sulfur.

Crystalization of the sulfur is result of the oxydation of primary sulphide ores from hydrothermal veins.

The examined sample inv. no. 600:ZAG;5652:MP1 kept in the collection of the Department for Mineralogy and Petrography of the Croatian Natural History Museum in Zagreb. The separated and measured sulfur crystals are kept in the same collection, inv. no. 600:ZAG;5651:MP1. The sample belongs to the old holdings of the former Museum of Mineralogy and Petrography.

#### REFERENCES

- GOLDSCHMIDT, V., 1897: Krystallographische Winkeltabellen. 313, Verlag von Julius Springer, Berlin.
- HUMMEL, W., 1982: Bestimmung von Gitterparametern aus Pulverdiagrammen, Tübingen.
- HUMMEL, W., 1988: MPDS - Mineral Powder Diffraction Search. Version 3.0, Bern.
- PALACHE, C., BERMAN, H. & FRONDEL, C., 1952: The System of Mineralogy. Vol. I, 7<sup>th</sup> edition, 140, John Wiley and Sons, Inc., Chapman and Hall Ltd., New York - London.

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