

NEW DATA ON SYNGENITE (KALUSZITE)

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More than 50 mineral species were first discovered in the Carpathian region. Only two of them were found in the Ukrainian part of the Carpathians: syngenite from Kalush area (the Precarpathians, Miocene molasse sedimentary rocks) and karpatite from Oleneye area (the Transcarpathians). Syngenite was described almost simultaneously by J. Rumph and V. Zepharovich in 1872 (KOROBTSOVA, 1955). The former author had discovered this mineral on half year earlier and named it as kaluszite, the later one named his find as syngenite. Later syngenite was found in other occurrences of the Precarpathians (Morshyn, Stebnyk). These crystals were described by R. Zuber in 1904, J. Tokarski in 1910, 1913 and Cz. Kuzniar in 1934. In 1955 considerable progress has been made in the systematical research of syngenite (KOROBTSOVA, 1955).

Our main goal in this study is to present results of complex investigations of syngenite from new occurrence and to compare them with already published data. New find of syngenite crystals was made in sediments of Golyn' syncline (Kalush-Golyn' group of potassium-magnesium salt deposits). Here potassium-bearing strata has a thickness of 300–600 m. It contains layered and breccial clays with lens of halite and potassium salts which are represented by langbeinite-kainite rock and sylvinite. Statistically representative set of syngenite crystals (about 500 samples) from gypsum – clay cap (sole mark 265–270 m) of Dombrove quarry was examined. Syngenite crystals were extracted from gray clay. The crystal sizes are 0.5–30 mm along [001].

New data

Some groups of fluid inclusions (primary and secondary) have been determined in the syngenite crystals. Primary inclusions of the first group have either isometric form of negative crystals (50–70 μm in size) or complex one with a size up to 1–3 mm. Most of big inclusions have high degree of filling. All inclusions take place in the central part of the crystals. Inclusions composition is: aqueous solution (90–95 %) + gas (1–2 %) + solid phases (3–9%, isotropic minerals prevail). Homogenization temperature of gaseous phase is

equal or less then 60–67 °C (± 1 °C). Eutectic temperature is in the range from –8.3 to –9.0 °C (± 0.2 °C).

The second group of primary inclusions (0.2–0.3 mm in size) consists of tubular and tabular negative crystals, which coincide with [001]. Gaseous bubble appears at cooling and disappears at the temperature 40–47 °C. T_{eutectic} is between –22.4 and -22.6 ± 0.2 °C. $T_{\text{ice melting}}$ is from –8.3 to 12.8 °C. Liquid inclusions in syngenite with T_{eutectic} is similar to the system NaCl–H₂O ($T_{\text{eutectic}} = -21.1$ °C) and NaCl–KCl–H₂O ($T_{\text{eutectic}} = -22.9$ °C). Its concentration is from 12.1 to 16.7 wt% NaCl equiv.

Syngenite formation is a result interaction of the anhydrite and halite rocks with solution enriched in KCl and K₂SO₄. For growth of syngenite high concentration of KCl in solutions is necessary (more 8% of KCl after Lepeshkov I. M.) (KOROBTSOVA, 1955); it is in good agreement with our data on fluid inclusions.

Concluding remarks

The syngenite crystals from Dombrove quarry often show a combination of simple forms with big values of d_{hkl} . Most of the crystals have {100} pinacoidal habit. Main simple forms of the crystals are {100}, {010}, {001}, {101}, $\{\bar{1}01\}$, {110} and {011}. Obtained infrared spectra of the syngenite crystals are typical for syngenite and confirm its structure peculiarities. Therefore the crystallization conditions of syngenite were optimal. At the beginning the syngenite crystals grow from KCl-enriched solutions at the temperature equal or less then 60–67 °C (KCl–H₂O system has the $T_{\text{eutectic}} = -10.8$ °C). At the end of syngenite crystallization it was held from NaCl-enriched solutions at the temperature equal or less then 40–47 °C. Concentration of solutions was 12.1–19.7 wt. % NaCl equiv.

Reference

KOROBTSOVA M. S. (1955) Mineralogy Potassium salts deposits of Eastern Precarpathians. In: Problem of Mineralogy of Sedimentary Formations. Vol. 2. L'viv National University Publ., L'viv, Ukraine, p.3 – 137 (in Russian)