GEIGERITE, A NEW MEMBER OF THE KRAUTITE-VILLYAELLENITE PARAGENESIS FROM SĂCĂRÂMB (SOUTHERN APUSENI MTS., ROMANIA)

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The Săcărâmb (formerly Nagyág) low-sulphidation epithermal deposit is located in the southern termination of the "Gold Quadrilateral" of the Apuseni Mts., Romania. The deposit is hosted by amphibole andesites containing plagioclase, biotite, quartz and sparse resorbed pyroxene. Besides common sulphides and tellurides, Mn-minerals are unusually common and diverse. As-bearing sulphosalts, As-sulphides and native As are common in several segments of the deposit, too. Arsenates were observed in the late stage hydrothermal products related to the presence of As. Săcărâmb is the type locality of krautite, $MnAsO_3(OH)_2 \cdot H_2O$ (FONTAN *et al.,* 1975). Villyaellenite, $Mn_5(AsO_3OH)_2(AsO_4)_2 \cdot 4H_2O$ was also reported from krautite-bearing hydrothermal samples (GHERGARI *et al*., 1994), accompanied by arsenolite and native arsenic. The current study adds a new member, geigerite, $Mn_5(AsO_3OH)_2(AsO_4)_2 \cdot 10H_2O$, to that paragenesis.

Geigerite, described for the first time from Romania, was found in samples from the Bernad adit. The material studied is a breccia-like brown to pink aggregate, with several millimetre sized groups of minute lamellar crystals. The aggregates are grown on a silky, fibrous to earthy material. Crystals of dark pink, pale pink to colourless and light blue colours were observed. Subspecimens, individual crystals for X-ray powder diffractometry (XRD), scanning electron microscopy (SEM) and energy dispersive spectrometry (EDS) were carefully prepared under stereomicroscope. XRD investigations were performed on ~1 mg samples with "zero-background" sample holder on a Bruker D8 Advance diffractometer (Cu*K*α, 40 kV and 40 mA). SEM and EDS investigations were carried out on polished specimens on a Hitachi S-8400 microscope equipped by Bruker X-flash EDS detector.

The silky material supporting the arsenate crystals proved to be amorphous by XRD (with a low quartz content), and was found to be a mixture of SiO_2 and Mn-arsenates by SEM and EDS. The dark pink crystals are krautite aggregates, with the main observed XRD peaks (d Å/hkl) at 7.980/020 and 100, 7.137/110, 5.643/120, 3.992/040 and 200, 3.863/210 and 3.187/230 and $\bar{1}12$. The pale pink crystals are mixtures of krautite and villyaellenite, presenting the peaks at 8.991/200, 8.280/110, 6.474/$\bar{1}11$, 6.168/111, 4.658/020 and $\bar{3}11$, 4.494/400 and $\bar{2}02$, 3.275/$\bar{5}11$, 3.235/420 and $\bar{2}22$ and 3.079/222 for villyaellenite. SEM observations reveal zoned Ca-substitution in the euhedral crystals, from 1 to 4 wt% (by oxides) according to EDS. For geigerite the main XRD peaks are 10.472/010, 7.836/100, 3.486/030 and 2.789/230. Traces of villyaellenite are also present. EDS measurements indicated the presence of calcium in <0.5 wt% (by oxides) as well as the variation of the As content.

The (Ca + Mn)/As (in atomic weight percents, without H) ratio of measured data is clustered around 0.75 (± 0.02) for the dark pink crystals, while this ratio for krautite is 0.73. For the blue crystals a value of 0.93 (± 0.03) is obtained, while geigerite is of value 0.92. Villyaellenite was detected as solid-solution with krautite. The silky mass supporting the crystals gave 0.69 (± 0.06) values (with no Ca content), which is not appropriate for any Mn-arsenate.

Based on the position of differently colored crystal groups relative to the silky matrix, a crystallization sequence of krautite to krautite-villyaellenite to geigerite is suggested. Geigerite, being the latest, the most hydrated phase, is rich in fluid inclusions, too. The high water/fluid content decreased the reliability of the EDS measurements.

References

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