

BARIUM MINERALIZATION WITHIN THE TULGHEȘ GROUP, EAST CARPATHIANS, ROMANIA

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A Ba mineralization, less known than the Mn and sulphide ones, also is situated in the Cambrian Tulgheș Group (TG) extending over more than 200 km. The Mn belt is situated at the bottom and the sulphide belt on the top of TG. The Ba mineralization is present in the whole TG together with both Mn and sulphide belts. It has a large development of about 10 km at the crossing of two belts Holdita-Paraul and Caselor-Brosteni-Borca, with the same orientation (NW-SE), like the Mn and sulphide ores. The mineralogy of TG is simple and uniform being made up generally of five major minerals in variable proportions: quartz, muscovite albite, chlorite, Ca-Mg-Fe-carbonates (\pm graphite \pm titanite \pm rutile \pm stilpnomelane \pm ilmenite \pm magnetite \pm pyrite). Its huge thickness is due to its developmental history in a narrow deep, active subduction zone. The rocks of TG are metamorphosed under greenschist facies and display a pronounced schistosity, having some similarities with that of burial metamorphism. During metamorphism, the wall rocks were tidily folded and microsheared. VODA & VODA (1980) have described the Holdita-Brosteni syngenetic barite ore deposit, as conformable beds within the metamorphic formation of the black quartzites of the TG. The lithostratigraphical sequence with Ba mineralization of about 80–120 m comprises on the bottom, a lens of Mn ore and on the top, a barite lens banded by sulphide ore. The **barite** ore contains **Ba-feldspars** (celsian, hyalophane), **cymrite**, **barytocalcite**, **benstonite**, **aragonite**, **witherite**, phlogopite, sericite, diverse carbonates and quartz. Pyrite, and other sulphides, including sphalerite, bornite, galena, chalcocopyrite, tetrahedrite-tennantite also occur. **Alabandite**, sometimes associated with **pyrochroite** also occurs in the Mn belt, in reduced tephroite parageneses. The Mn belt also contains other Ba minerals, including celsian, hyalophane, barite and cymrite as accessory minerals. This indicates a genetic link between the Ba and Mn mineralization, which is suggested to have formed by the same submarine hydrothermal process on the Cambrian sea floor. The lenses of Mn-carbonate-silicate ore are closely interbedded with barite ore. This close interbedding of barite, Mn and sulphide ores demonstrates their common origin and evolution. Barite is the main barium mineral (more than 70%) of these deposits, having isometric grains of 0.5 mm diameter and more, forming compact, grainy aggregates from several cm to 4 m. In the Holdita deposit, the late barite replaces the earlier Ba-feldspars. The Holdita barite contains: BaO = 65–77%, SO₃ = 33–19%, and SrO = 3–4%. There is some isomorphism with celestine. The hydrothermal

activity (like springs) began on the Cambrian seafloor, where the Mn ores were deposited and mixed with little barium mineralization in the distal zones. In the southern area, the barium is predominant, where it is mixed with some Mn and sulphide mineralization. The Ba-feldspars occur in crystals ranging from a few mm to 1 cm and even larger, forming thin layers interbedded with other enriched layers of barite, apatite, sulphides (mostly pyrite, but also alabandite, chalcocopyrite occur). Celsian is the predominant Ba-feldspar. Hyalophane is very rare. The primary substitution is between BaAl and KSi series (KAlSi₃O₈–BaAl₂Si₂O₈) seems to be continuous. However exsolutions of hyalophane in celsian in the same grain shows a compositional gap between the two minerals on the BSE images from Holdita deposit. The celsian contains over 90% BaAl₂Si₂O₈ component (Cn), whereas hyalophane contains under 30% Cn, consistent with the presence of a substantial compositional gap. The Ba feldspars are replaced by barite and by cymrite plates (HIRTOPANU *et al.*, 2008). The relics of celsian in cymrite may have escaped the reaction because locally P_{H₂O} may have been lower than P_{fluid}, and when P_{H₂O} was higher than P_{fluid}, celsian did not form. The real situation could be more complex kinetically, *e.g.* the substitution process could be not completed because its speed was too low, or because the activity of H₂O decreased. The coexistence and phase relations between celsian and cymrite are of great petrological interest being a natural example of the experimentally established reaction curve, celsian + H₂O = cymrite (ESSENE, 1967). The lineally developed Ba, Mn and sulphide mineralization belts evolved in a subduction zone of the Cambrian sea floor, in a narrow active paleotrench area. The hydrothermal submarine activity began with Mn ore with little Ba in the North and more Ba and little Mn in the South. Later, in the upper Cambrian, the sea floor was subducted towards the East and sulphides were deposited at some distance from, and over the Mn ore containing body.

References

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