Fluid Evolution of the Ostra Hydrothermal Cu-Zn-Pb-Barite Mineralisation (Eastern Carpathians, Romania)

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The Eastern Carpathians are a part of the Carpathian Mountains in Central Europe. They host a series of volcanogenic massive sulphide (VMS) deposits. The Ostra polymetallic mineralisation is situated in the northern range, in Romania. It is one of the various polymetallic Pb-Zn-Cu-Au-Ag, Cu-pyrite, barite, Fe-Mn, and uranium mineralisations, which are associated to the low-grade methamorphic Tulgheș Lithogroup of the Crystalline-Mesozoic Zone. The geologically correlated, close-by VMS occurrences (e.g., Leșul Ursului and Mănăila) have a proven [Cu (Au-Pb-Zn-Ag-barite)] content, which could provide an innovative approach to the belt scaled exploration.

Ostra was actively mined for barite in the 1900s; in spite of this, detailed mineralogical and geochemical data are not available. The barite, together with the underlying massive sulphide bodies, is hosted by a porphyroid rock. The ore mineralisation consists of pyrite, chalcopyrite, sphalerite, galena, and fahlore; the gangue minerals are barite and rare quartz. Barite occurs in two textural and paragenetic relationships: it can either be associated with distal parts of the massive sulphide lenses, or it can form massive bodies (without sulphides) in the host porphyroid rock. The composition of the barite is similar in each type; Sr content up to 3.64 wt % is common. Primary fluid inclusions of barite associated with the distal sulphides were trapped from a homogenous parent fluid, which can be modelled in NaCl-H_2O system. The homogenisation temperatures (minimum formation temperature) are Th(LV-L)=145-180°C; salinities are 3.7-5.3 NaCl equiv. wt. %, showing slightly higher values compared to modern seawater. Low formation temperature (<200°C) of the distal ore is supported by the low Fe content of syngenetic sphalerite, while the proximal ore of the massive sulphide lens formed at higher temperature (270±10°C, based on pyrite and sphalerite thermometry). More intense mixing with ambient seawater in the distal parts could cause this observed temperature decrease.