
Authigenic Phyllosilicates in the Middle Triassic Kremikovtsi Sedimentary Exhalative Siderite Iron Formation, Western Balkan, Bulgaria

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Abstract: Two distinct assemblages of authigenic phyllosilicates were distinguished in the Kremikovtsi sedimentary exhalative (SEDEX) siderite iron formation (SIF) and noted as important tracers of two styles of mineralization characteristic of this type of ore deposit. Hydrothermal-sedimentary layer silicates are represented by rare occurrences of relict microcrystalline Mg-rich berthierine with a relatively low degree of structural ordering, associated closely with framboidal pyrite as an intergranular matrix cementing sparry siderite grains; the larger silicates are also represented by the diagenetic transformation product of berthierine, chamosite. Berthierine precipitated under anoxic conditions during advanced early diagenesis after chert deposition.

Hydrothermal-epigenetic phyllosilicates (berthierine, chamosite, illite-smectite (I-S), and kaolinite) from the barite-sulfide assemblage are characterized by: crystalline and undeformed habits; relatively larger particle size, low-temperature polytypes, low to no mixed layering, and a high degree of crystallinity; absence of impurities and dominant monomineralic aggregates; affiliation to initial open spaces and deposition mainly as vug fillings and linings. They formed under pronounced control by the vuggy porosity of the siderite host caused by the invasion of acid (pH = 3– 5), hot (200– 230° C) hydrothermal fluids probably at the stage of burial diagenesis of the SIF under relatively stable reducing conditions fluctuating near the sulfide/sulfate stability boundary ($\log P_{O_2} \cong -30$). The greater Al concentration in hydrothermal solution than in seawater determines the

affiliation of phyllosilicates in the Phanerozoic SEDEX SIFs to aluminous species (berthierine, chamosite) unlike low to non aluminous ones (greenalite, stilpnomelane) in the Precambrian IFs. The berthierine compositions, expressed by the Mg/Fe vs. Al/Si ratios, are a sensitive indicator of the geological conditions under which they formed (marine, non-marine, hydrothermal ore and pre-ore), thus allowing the genetic discrimination of this mineral from various localities.

Key Words: Barite • Berthierine • Carbonate-hosted • Chamosite • Illite-smectite • Iron Formation • Kaolinite • SEDEX • Siderite

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