

BLACK SHALE HOSTED EAST CARPATHIAN MANGANESE DEPOSITS: GENESIS AND METAMORPHIC EVOLUTION

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In the Eastern Carpathians (Romania), the cherty beds in the black shales of the Tulghes Group (Cambrian-Ordovician in age with Caledonian metamorphism under greenschist facies conditions) host manganese and barite deposits. The primary manganese ore consists of carbonate-silicate lenses (15-35% manganese, 1-25% iron, manganese higher than iron), up to 50 m thick, occurring inside larger, slightly mineralized areas (1-15% manganese, 1-23% iron, iron higher than manganese). Manganese and iron concentrated in an euxinic basin where submarine wells locally changed the Eh-pH conditions, determining the oxidation of the organic carbon to carbon dioxide and the precipitation of the two metals as carbonates. The trace element content, higher in the black cherts than in the orebodies were considered evidence for a rapid deposition of the latter. During the first stage of metamorphism the water inherited from the sedimentary milieu stimulated the formation of hydrous silicates (mainly mangangrunerite and stilpnomelane) besides spessartine, rhodonite, pyroxmangite and tephroite. The subsequent circulation of carbon dioxide-rich, water-poor fluids from the black cherts towards the orebodies determined the extended carbonation of the silicates, especially of amphiboles. The reducing conditions favored local increases of sulfur fugacity generating pyrite pseudomorphs on silicates and pyrite porphyroblasts grown at the expense of the carbonates. These replacements form metasomatic-type aureoles around the orebodies.