

MINERALS OF THE METAMORPHOSED Mn-Fe DEPOSITS IN ROMANIA: OLD DEPOSITS, NEW SPECIES

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The main metamorphosed Mn-Fe deposits in Romania are hosted by metamorphic sequences of Upper Precambrian (South Carpathians) and Lower Cambrian ages (East Carpathians) and their mineralogical composition is quite different, although the major minerals are the same, i.e. the olivines, rhodochrosite, pyroxmangite, rhodonite, etc: (1) Razoare Mn-Fe deposit (Preluca Mts, East Carpathians), silicate-carbonate-oxide-sulphide (2) Dadu, Colacu, Oita, Tolovanu, Puiu, Caprarie, Arsita, Argestru, Todireni, Sarisor, Dealu Rusului, Mandrileni, Ulm-Sihastru, Holdita, Brosteni, Borca Mn deposits (Bistrita Mts, East Carpathians), carbonate-silicate-oxide-sulphide; (3) Pravat, Leucus, Bretan, Strambu, Jigureasa, Valea Untului, Cugir Valley, Rovina, Rascoala Mn-Fe deposits (Sebes Mts., South Carpathians), silicate-carbonate (subsaturated, queluzite) and silicate-quartz (saturated, gondite); (4) Paltinis, Sadu Valley, Sadurel Valley Mn deposits (Cibin Mts, South Carpathians), spessartine type (gondite); (5) Delinesti Mn-Fe deposit (Semenic Mts, South Carpathians), silicate-carbonate-oxide. About 350 mineral species and mineral varieties have been identified in the mentioned deposits. By far the Bistrita occurrences are the richest in minerals, including rarities such as silicates-arsenates (schallerite, nelenite, etc.), Cl-bearing phyllosilicates (manganpyrosmalite, friedelite, mcgillite, etc.), nambulite, bannisterite, androsite-(La), etc. not found yet in South Carpathian occurrences. In addition, the Bistrita minerals commonly show compositional zoning, which was used to reconstruct the metamorphic evolution.

The minerals from Romanian Carpathian metamorphosed Mn-Fe ores belong to the following mineral classes: **I. Native elements:** gold, bismuth, graphite; **II. Sulphides:** alabandite, hauerite (?), pyrite, chalcopyrite, galena, pyrrhotite, cattierite, bornite, löllingite, tetrahedrite, tennantite, matildite, bournonite, semseyite, freibergite, boulangerite, molybdenite, Bi arsenide with Cl, sulphide-arsenide with Cl, Bi-telluride, tetradymite, skutterudite, matildite, nickeline, cobaltite, linneite, kesterite, arsenopyrite, safflorite, geerite, breithauptite, stannite, wurtzite, carrollite, glaucodot, rammsbergite, etc. **III. Oxides:** primary oxides: jacobsite, magnetite, bixbyite, braunite, neltnerite, hausmannite, pyrophanite, iwakiite, hematite, ilmenite, senaite (with Sr, Ca, V, Nb and Zn), cassiterite, thorianite, högbomite, rutile, perovskite, samarskite; quartz group: α -quartz, stishovite (?), coesite (?), opal, moganite, etc. and secondary oxides: nsutite, pyrolusite, ramsdellite, manganite, hollandite, lithiophorite, manjiroite, goethite, ranciéite, todorokite, birnessite, coronadite, crednerite, cryptomelane, pyrochroite, asbolane, dias-

pore, groutite, etc. **V. Carbonates:** calcite, dolomite, rhodochrosite, kutnohorite, witherite, aragonite, magnesite, siderite, ankerite, Fe-rhodochrosite, smithsonite, azurite, malachite; **Borates:** tusionite. **VI. Sulfates:** barite, khademite, jarosite, rozenite, szomolnokite, gypsum, etc.; **Wolframates:** hübnerite, ferberite; **VII. Phosphates:** hydroxylapatite, carbonate-hydroxylapatite, Mn-apatite, chlorapatite, fluorapatite, switzerite, brushite, monazite-(Ce), monazite-(La), evansite, xenotime-(Y) (with Eu and Gd), variscite, etc.; **Arsenates:** magnussonite, sarkinite, johnbaumite, manganarsite, hedyphane, etc. **Vanadates:** Ba-vanadates. **VIII. Silicates:** **A. Nesosilicates:** 1. Olivine group: Mn-fayalite, Fe-tephroite, tephroite, Mg-tephroite; 2. Manganese humites: sonolite, alleghanyite, manganhumite; 3. Leucophoenicite humites group: ribbeite, leucophoenicite, jerrygibbsite; 4. Garnets: spessartine, spessartine-calderite, grossular, Ti-spessartine-grossular, almandine, Mn-almandine, spessartine-andradite-grossular, anisotropic spessartine-andradite, etc. 5. Zircon, thorite, titanite, greenovite, etc. **B. Sorosilicates:** 1. Yoshimuraite, bafertsite, etc.; 2. Epidote-zoisite group: epidote, piemontite, allanite, Mn-allanite, zoisite, "thulite", androsite-(La), etc. **C. Cyclosilicates:** 1. Tourmaline group: dravite, schorl, etc. **D. Inosilicates:** 1. Pyroxenes: Mn-ferrosilite, Mn-hedenbergite, johannsenite, Fe-johannsenite, augite, diopside-augite, Na-augite, aegirine-augite, Ti-aegirine-augite, aegirine, namansilite, etc.; 2. Pyroxenoids: pyroxmangite, rhodonite, nambulite, natronambulite, inesite, pyroxferroite (?); **Amphiboles:** grunerite, manganogrunerite, manganocummingtonite, kozulite, magnesioriebeckite, magnesiocummingtonite, "crocidolite", riebeckite, winchite, ferroferriwinchite, ferro-anthophyllite, Li-eckermannite, richterite, K-richterite, magnesiohornblende, arfvedsonite, ferroglaucofane, "crossite", Mn-actinolite, ferroactinolite, Mn-tremolite, etc. **E. Phyllosilicates:** phlogopite, Mn-phlogopite with Ni, norrishite, biotite, Ti-biotite, Mn-biotite, muscovite, kinoshitalite, anandite, illite, annite, chloritoid, bannisterite, Ba-bannisterite, ganophyllite, parsettensite, manganpyrosmalite, friedelite, caryopilite, schallerite, sugilite, nelenite, minnesotaite, otrérite, pennantite, clinocllore, greenalite, antigorite, kellyite, nimite, lennilenapeite, coombsite, bementite, sepiolite, etc. **F. Tectosilicates:** 1. Feldspar group: albite, microcline, celsian, hyalophane, orthoclase. 2. Helvite group: helvite, genthelvite, homilite.

For all the occurrences the metamorphic evolution is quite complex, generally showing several metamorphic events, mainly of retrograde character.