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BRUCITE DEPOSITS IN THE APUSENI MTS., ROMANIA

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In the northern part of the Apuseni Mts. (NW Romania) the intrusion of Late Cretaceous-Early Paleogene granodioritic magmas into the surrounding Mesozoic and Paleozoic rocks, i.e. dolomites, limestones and other sediments, generated extended and complex contact aureoles, comprising skarns, hydrated metasomatic rocks and hornfels, respectively. Among them, large brucite-bearing zones occur in Anisian dolomitic marbles, forming two main deposits: Budureasa in the north and Pietroasa in the south. The contact of granodiorites with the Anisian dolomites shows a zoned structure i.e. a transition from Mg-skarns to brucitic zones and finally to dolomites. Brucite-bearing zones occur only at some distances from the contact and are irregular, sometimes lens-shaped; they are up to several meters wide and tens to hundreds of metres long.

The bulk chemical analyses of the brucite-bearing dolomitic limestones point to heterogeneous distribution of brucite within both deposits with either brucite-rich (up to 40%) or brucite-poor domains (less than 5% brucite). Brucite forms small lamellae of 20x20x2 μm up to 80x50x6 μm, occurring in clusters of various shape and size: a) small, isometric clusters, about 100 μm in diameter, rarely containing relics of periclase; b) large, irregular or rhombohedral-shaped clusters, often containing carbonate relics; the diameter of these clusters ranges from 0.5 up to 1.6 mm and c) oval-shaped clusters, about 0.1 x 0.3 mm in average, with brucite associated with forsterite relics and serpentine minerals.

Microprobe investigations reveal 86.05-86.51% MgO in brucite, as well as the presence of the same mixture of calcite + dolomite grains inside the brucite cluster as in the surrounding carbonate mass. The brucite-bearing assemblages can be described in the CaO-MgO-SiO_2–H_2O-CO_2 system, with the following minerals: calcite-dolomite-periclase-brucite-forsterite-antigorite. The stability field of brucite is restricted to very low X_{CO2} (< 0.05) over a wide range of temperatures, up to 610°C.

Our studies revealed that heating and cooling occurred under conditions of very low X_{CO2} during the contact metamorphism of the Anisian dolomites by the (hydrous) granodiorites. The stratigraphic column of sediments covering the granodiorites at the time of the intrusion ranges from 2.5 to 4 km, pointing to approximately 0.1 GPa pressure for the contact metamorphism. At this pressure the upper stability limit of brucite is at 600-610°C, according to reaction br = per + H_2O. Lower temperatures, at 400°C, can be estimated from the decomposition of forsterite according to reaction 20br + atg = 34fo + 51H_2O. The direct decomposition of dolomite according to the reaction dol + H_2O = br + cc + CO_2 can take place over a wide range of temperatures.