



Granulites of the eastern region of Minas Gerais, Brazil: examples of parageneses of high and low-pressure

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Paragneisses and metabasic rocks of eastern region of Minas Gerais, Brazil, contains parageneses formed under conditions of granulite metamorphism, but under different pressure conditions. In metasedimentary rocks, the co-existence, sometimes of kyanite, potassic feldspar, rutile and garnet, or sometimes of cordierite, sillimanite, garnet and hercynite, confirm these high-grade conditions. In both cases, primary micas are absent. In the case of the kyanite - K-feldspar pair, the parageneses indicates high-pressure type, while those with cordierite indicate conditions of the low-pressure type. The metabasic rocks also exhibit granulitic parageneses containing minerals such as orthopyroxene, clinopyroxene, plagioclase and some quartz. In these rocks, parageneses occurs with or without clinopyroxene, but always with plagioclase and are interpreted as resulting from the crystallization of igneous material of basic composition under granulite facies conditions. Still under conditions of the metamorphic granulitic event, parageneses representing conditions of the peak of metamorphism were partially replaced due to the following conditions: 1) variations in terms of pressure under high temperature conditions (adiabatic decompression), 2) isobaric cooling in the early stages of exhumation processes and 3) pressure increase under high temperature conditions (compressional stage). The first two conditions occur in the paragneisses, with transformation of garnet into cordierite in the first and of hercynite and quartz transforming to garnet or cordierite in the second. The presence of cordierite around garnets represent a result of a pressure reduction under high temperature conditions, induced mainly by decompression processes associated with the exhumation of these gneisses to shallower positions of the crust during stages of collisional tectonics that affected the region. This transformation would have occurred in the initial stages of decompression under granulitic conditions. On the other hand, the reduction of temperature also in the initial stages of the exhumation process would explain reactions involving hercynite and quartz to produce garnet or cordierite. The presence of garnet borders between orthopyroxene and plagioclase crystals in metabasic rocks, formed by increasing pressure, is a consequence of the third condition. This presence is the evidence that these granulites experienced higher pressure conditions as consequence of eventual compressional stage associated with tectonic transport of these materials to higher levels of the crust. In the area, tectonic exhumations with transport of these rocks of high grade (granulitic) to higher levels, can be proved by the fact that these rocks are laterally in contact with other metamorphic rocks equally rich in aluminum, but generated under lower metamorphic conditions (low to medium amphibolite facies). The presence of micaceous minerals and parageneses involving staurolite, garnet, kyanite or sillimanite and sometimes feldspars confirm the characteristics of lower metamorphic grade for these rocks. Finally, micas, chlorite and amphiboles represent the last adjustments of the granulitic parageneses to post-exhumation conditions.