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The origin of mangerites from granulites partial melting in the Socorro-Guaxupé Nappe, MG, Brazil

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In southeastern Brazil, an important rock association including granulites, migmatites and granite-charnockite bodies constitute the Socorro-Guaxupé Nappe, an allochtonous terrane, which represents the root of a Neoproterozoic magmatic arc, part of the Brasília Orogen. Three important anhydrous igneous suites are recognized within the whole pile of the nappe: São Pedro de Caldas, Divinolândia and Paraguaçu, being the last one with the poorest characterization, so far. Charnockite rocks constitute the three suites, mainly mangerite in composition, isotropic or foliated, medium- to coarse-grained, grey to light green, which have tabular shape and it is intrusive in metatexite and diatexite. Zircon saturation thermometry yielded temperatures of 900 °C for crystallization of the magma, which occurred at 625 Ma, the same age of the metamorphism. For the Paraguaçu Suite, mangerite presents high Ba/Rb ratios indicating a source previously depleted in Rb and enriched in Ba, which may be linked to the generation and extraction of granitic melts due to biotite breakdown and production of K-feldspar. LREE patterns present enrichment relative to chondrite, about 100 to 300 times, whereas HREE are 10 to 40 times richer than chondrite, and positive or no Eu anomalies are observed. Felsic garnet granulite is depleted in all REE in relation to mangerite, although presents enrichment in LREE in relation to chondrite, 70 times, and no Eu anomaly. Peak mineral assemblage for the felsic garnet granulite is orthopyroxene, clinopyroxene, garnet, plagioclase, orthoclase and quartz; all hornblenda and biotite are retrometamorphic. Thermobarometry and pseudosection modeling of basal portion of Socorro-Guaxupé Nappe provides metamorphic peak conditions of *ca.* 950 °C at 11.5 kbar, characterizing it as an ultra high-temperature metamorphism. The *P-T* conditions match with the ones required to produce the mangerite magma and the observed dry suites. The residue of these suites, the felsic garnet granulite, is poor in radiogenic elements, such as Rb, Cs, U, Th and also in HREE. The partial melting in ultra high-temperatures was able melt zircon and apatite, producing a residue HREE -poor, even if it is rich in garnet.