GRAPHITE-BEARING MANGANESE ORE OF THE MIGUEL CONGO MINE, QUADRILÁTERO FERRÍFERO, MINAS GERAIS, BRAZIL

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The Miguel Congo manganese mine is located in the southeastern portion of the Quadrilátero Ferrífero in the state of Minas Gerais, Brazil. The mine exposes banded iron formation of the Paleoproterozoic Cauê Formation, metamorphosed under amphibolite-facies conditions (tremolite-anthophyllite zone). Manganese ores occur as ESE-trending pod-like bodies within this succession. Nsutite is the dominant manganese mineral, with minor amounts of pyrolusite. Nsutite forms a groundmass enclosing aggregates of 0.15 mm-sized quartz grains with 120° triple-junctions. Euhedral crystals of mixed pyrophanite-ilmenite also occur in nsutite and as small (0.02 mm) inclusions in quartz. Graphite is a minor component and forms scattered subhedral flakes in quartz. Low valency manganese oxides have not been observed, nor have magnetite or hematite. In contrast with typical Miguel Congo magnetite-rich ore which has Fe/Mn ratios as high as 1:1, analysis of a sample of the graphite-bearing manganese ore showed values of 3.54% Fe and 53.73% Mn, an Fe/Mn ratio of 0.07:1. This latter type is rectricted, occurring in compact 10-50 cm pockets. The graphite and pyrophanite metamorphic mineral assemblage reflects local anoxic metamorphic conditions whitin an oxid environment represented by magnetite- and hematite-bearing manganese ores and the enclosing banded iron formation.