

Metamorphic evolution at Quadrilátero Ferrífero and its relation to hematite and magnetite formation

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Metamorphic grade at QF increases eastward, from greenschist to amphibolite facies, according to the increase of grain size of quartz and specular hematite, disappearance of muscovite and chlorite, replacement of cummingtonite by actinolite-tremolite, of Mg riebeckite by aegirine and of stilpnomelane by biotite in the iron formation. Ferroan dolomites have their Fe-contents decreased and calcite is abundant. Almandine appears in the high grade zone. Chloritoid is replaced by staurolite in the pelitic units. Metamorphism occurred under acid and oxidising conditions, along the HM-buffer and above that curve. Micaceous hematite formed during the ductile, sindeformational progressive stage, which reached 450°C (carbonate geothermometry in coexisting carbonate) and compact hematite during the extensive, hydrothermal, perhaps retrogressive and brittle conditions, attaining up to 250°C (Th in fluid inclusions in cogenetic quartz), consisting of cement in breccia, replacement bodies and narrow veins.

At the Bonfim Complex, the BIF and associated rocks show increase in the metamorphic grade westward, along the amphibolite-granulite boundary. Graphitic phyllite becomes schistose, enveloping deposits of massive, lamellar and flaky graphite, being associated with sulphides. Itabirite contains pyroxene and encloses magnetite bodies. Patchy granulite/charnockite reveals the attainment of local high grade metamorphism, retrograded to amphibolite facies associated with subordinate hydrothermal activity. Temperature which may reached 700°C, fluctuated between 450°C and 600°C. Therefore, metamorphism in this region occurred under reducing conditions. Under higher grade situations magnetite is