In-situ geochemical compositions of magnetite and pyroxene from the early Paleoproterozoic Wuyang Iron Formation in the southern margin of the North China Craton

CAIYUN LAN[12], TAIPING ZHAO[1] AND CHANGLE WANG[3]

[1]Key Laboratory of Mineralogy and Metallogeny, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou 510640, China. tpzhao@gig.ac.cn

[2]University of Chinese Academy of Sciences, Beijing 100049, China. Lancaiyun@gig.ac.cn

[3]Key Laboratory of Mineral Resources, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China. wcl19875210@126.com

The Paleoproterozoic Wuyang Iron Formations (IF) on southern margin of the North China Craton (NCC) were metamorphosed under granulite facies, and are characterized with an assemblage of clinopyroxene, magnetite and orthopyroxene. Two types of iron ores can be identified on the basis of macro - and micro - textures: banded quartz - clinopyroxene (±othopyroxene) - magnetite ores and massive clinopyroxene - magnetite ores. Two - pyroxene geothermometry indicates that the primary counterparts of these ores have undergone metamorphism with a peak temperature of about 762±9°C. Both the banded and massive ores have also similarly IF-like REE+Y features, and thus are proposed to have all formed from chemical sediments. Similarly, clinopyroxenes from both types have IF-like rare earth element compositions and are rich in Fe (16-23 wt.% FeO_{totoal}), further suggesting that they are primary Fe-Mg-Ca-rich chemical sediments during metamorphism. Slight enrichments of TiO_2, Al_2O_3, Zr, Hf, Ta and Th of the Wuyang IF suggest relatively low detritus input. The massive ore have magnetite containing V, Cr and Ti much higher than those of the banded ores, suggesting that they may have undergone stronger secondary alteration possibly related to the intrusion of nearby pyroxenite plutons. Different ores have seawater-like REE+Y patterns with LREE depletions and positive anomalies of La, Eu, and Y, showing that granulite facies metamorphism did not essentially modify the primary compositions of the Wuyang IF deposited from paleo-seawater. Our results suggest less than ~0.1% contribution from high-temperature hydrothermal fluids.