Metamorphic Setting of High Grade Iron Ore, Mary River District, Nunavut

S.A. Fulcher[1], N. Duke[1], D. Moser[1]
[1]Department of Earth Sciences, University of Western Ontario, London, ON, Canada

Abstract

The Mary River Group is a 2.71 Ga Archean supracrustal assemblage, approximately 1-2.6 km thick, located within the Rae Domain of the Churchill Province on northern Baffin Island. It hosts currently the highest grade direct-shipping iron ores in the world with total iron content averaging 64% and grades exceeding 70%. Our understanding of iron enrichment processes is incomplete and the focus of research. The Mary River Group and the surrounding Mesoarchean and Neoarchean granite-greenstone terrane have been overprinted by the Paleoproterozoic Trans-Hudson Orogen. Discontinuous, 1-2 km long lenses of enriched Algoma-type iron formation are located within supracrustal keel folds juxtaposed against Hudsonian gneiss domes. This study tests the hypothesis that iron oxide enrichment is due to regional hydrothermal fluid movement related to post-collisional stabilization of the Trans-Hudson Orogen. Preliminary results indicate that dome/keel boundaries have experienced intense shearing and episodic greenschist to amphibolite facies metamorphism. Intense chlorite retrogression at the boundary occurred prior to porphyroblastic growth of almandine and amphibole porphyroblasts. The paragenetic sequence indicates hydrothermal alteration followed by transient thermal baking. Ore and metamorphic assemblages are interpreted to have originated contemporaneously as they show the same metamorphic overprinting and structural history. The paragenesis of high grade iron ore formation entails deformation and desilicifcation of banded iron formation followed by granoblastic recrystallization. Age bracketing of ore paragenesis and alteration of adjacent chloritized gneiss is currently being measured using LA-ICP-MS for U-Pb isotopic analysis. Dating of accessory minerals (e.g. zircon, monazite, xenotime, and allanite) first characterized with electron nanobeam techniques (EDS, WDS, CL, EBSD) are the first such measurements from Baffinland Iron Mines Corporation's deposit No. 1 ore zone, and will aide in exploration strategies.