Geological setting and genesis of high-grade iron ore depositsin the eastern Labrador Trough, Newfoundland and Labrador

James Conliffe

Geological Survey of Newfoundland Labrador, Department of Natural Resources, P.O. Box 8700, St. John's, Newfoundland and Labrador A1B 4J6, Canada

High-grade (>55% Fe) iron ore deposits have been intermittently mined in the Schefferville area since 1954, where they are commonly called Direct Shipping Ore (DSO) deposits. However, all mining to date has been concentrated in a narrow zone straddling the Labrador-Québec boundary, and little information has been published on high-grade iron ore deposits outside of this zone. High-grade iron ore deposits in the eastern Labrador Trough differ markedly from the soft DSO ore bodies of the Schefferville area. They form stratabound, tabular ore bodies and are composed mainly of hard, massive to laminated hematite-rich ore with lesser pockets of soft friable ore. The high-grade ore bodies are surrounded by altered iron formation with bands of partially leached chert and secondary hematite. A later, low-temperature alteration has variable affected both the high-grade ore bodies and the surrounding altered iron formation. Geochemical analyses show that the high-grade ore and altered iron formation are strongly depleted in Mg, Ca, and Na compared to unaltered Sokoman Formation taconites. Enrichment of Fe is not associated with a corresponding enrichment in immobile elements such as Al and Ti, indicating that the formation of these deposits was associated with the addition of Fe rather than simple leaching of silica. Hematite from the high-grade ore bodies is also associated with a strong depletion of $\delta^{18}O_{VSMOW}$ compared to magnetite in unaltered taconites.

The geological and geochemical characteristics of high-grade iron ore deposits in the eastern Labrador Trough are consistent with supergene-modified hypogene enrichment model. The main stage of iron enrichment is associated with the flow of large volumes of meteoric and/or formational waters during the deformation of the Sokoman Formation in the New Quebec Orogeny. These fluids were focused in structural zones (faults and fold hinges) and silica was leached and replaced by the precipitation of secondary hematite. Late-stage supergene alteration, which partially transformed hematite to goethite and remobilized Mn, may represent the same pre-Cretaceous supergene alteration recorded in the DSO deposits of the main ore zone or more recent groundwater circulation.

Atlantic Geology, 2015, Volume 51, Number 1
Geological Association of Canada Newfoundland Section Abstracts: 2015 Spring Technical Meeting
doi: 10.4138/atlgeol.2015.008