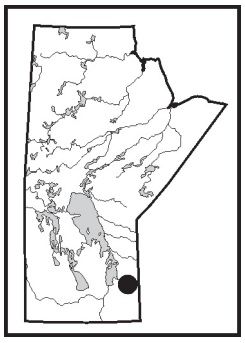
GS-18 Sulphide fragments in waste rock at the Maskwa open pit mine, southeastern Manitoba (NTS 52L6NW): investigations on petrogenesis, potential source rocks and mode of emplacement

by A.E. Stansell[1] and P. Theyer



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Summary

Thirty-three samples of sulphide-bearing fragments were collected from the rock-waste pile at the Maskwa open pit mine. Anomalous Ni:Cu ratios, combined with high Pt and Pd concentrations, were previously identified in rock samples collected from this locality. The samples are being geochemically and petrographically analyzed in order to a) establish whether one (or more) chemically and mineralogically distinct sulphide-fragment population exists, and b) seek evidence of sulphide remobilization and possibly identify the source rock of the sulphides. Microprobe analyses will be performed on selected sulphide samples as an aid in the interpretation of 1) the relationship between anomalous Ni-Cu and PGE concentrations, 2) the nature of the sulphide hostrocks, and 3) the potential role that metamorphism played in concentrating these sulphides.

Introduction

Part of the Maskwa pit rock-waste pile (Figure GS-18-1) consists of sulphide-rich fragments (fourteen of which have been analyzed to date) that display highly

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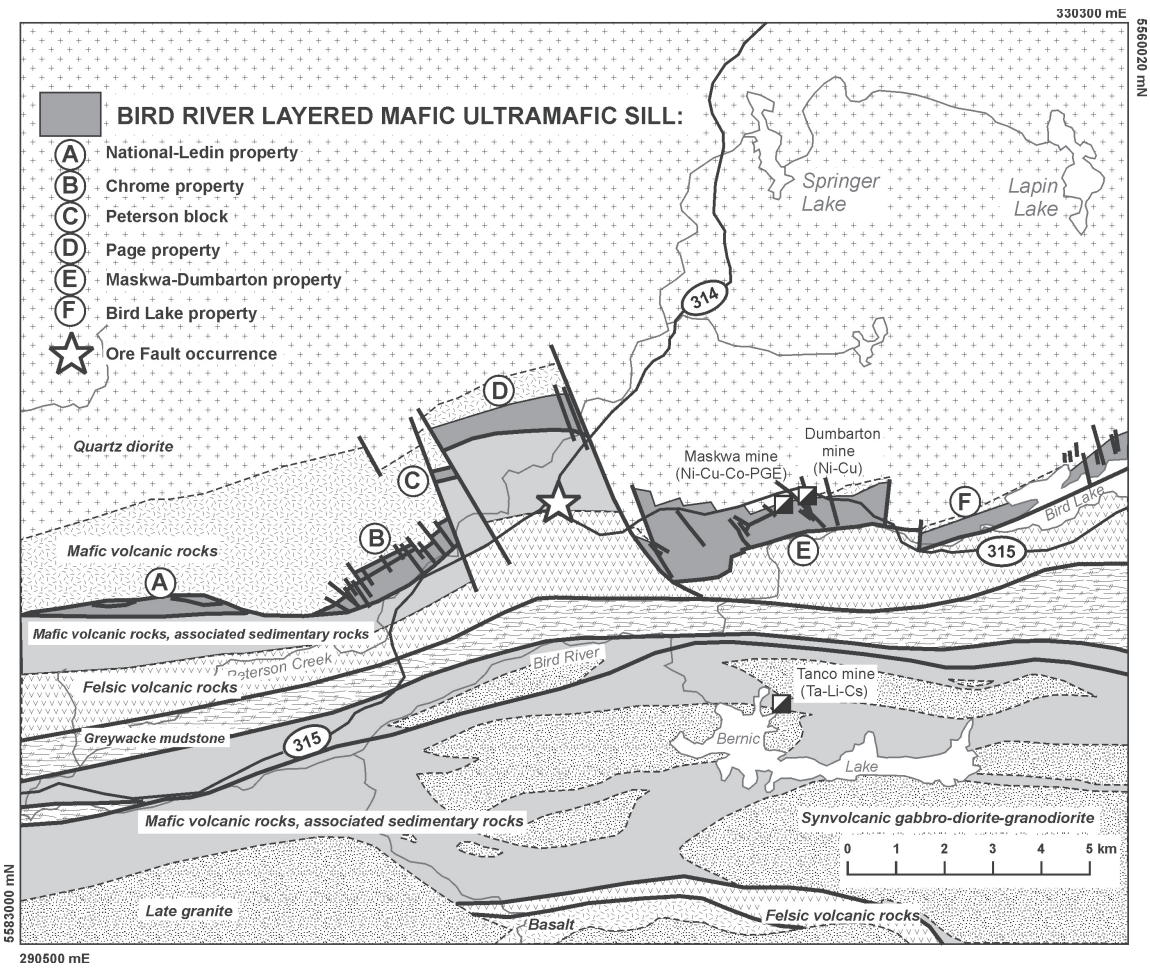

Figure GS-18-1: *Simplified geology of the Bird River greenstone belt, showing the location of the Bird River Sill and the Maskwa open-pit mine (*after *Theyer, 2000).*

anomalous Ni:Cu ratios (up to 150:1) and high combined Pt+Pd concentrations (some in excess of 8 g/t). A preliminary comparison with Ni-Cu-PGE mineralization elsewhere in the world shows that the Ni:Cu ratio of these samples is unique (P. Theyer, pers. comm., 2004). This study aims to

- determine the nature of the original sulphides (i.e., whether they were magmatic sulphides associated with the Bird River sill or of supracrustal or mixed origin);
- determine the mechanism and physicochemical parameters that created these unusual sulphides; and
- attempt to predict the probability of such Ni- and PGE-rich sulphides forming elsewhere in association with the Bird River Sill.

The research necessary to answer these questions will include the following steps:

1) inventory the mineralogy, mineral chemistry and petrography of the sulphide samples
2) determine the possible existence of one or several chemically and mineralogically distinct sulphide-fragment populations
3) classify the nature of the sulphides (i.e., magmatogenic and/or remobilized) and the physicochemical parameters thereof
4) identify the source rock of the sulphide fragments

The existence and extent of any possible sulphide remobilization will be identified by examining the role of fluid transport and deformation in the distribution of the sulphide-mineral species within the fragments.

Geology

The Maskwa open pit targeted the Ni-Cu mineralization concentrated at the base of the mafic-ultramafic Bird River Sill, located in the Bird River greenstone belt of southeastern Manitoba. The Neoarchean Bird River Sill (2745 +/–3 Ma; Wang, 1993) extends approximately east-west for over 20 km along the southern margin of the older Lamprey Falls Formation and is unconformably overlain by the Bernic Lake Formation (Gilbert, GS-13, this volume) The Bird River Sill is metamorphosed to greenschist facies; localized amphibolite-facies contact metamorphism is restricted to rocks adjacent to granitic intrusions (Juhas, 1973). Primary textures are generally well preserved, although metamorphic minerals replace most of the original minerals (Theyer, 2002).

Sulphide fragments

One of the sulphide-bearing fragments (Figure GS-18-2) disclosed a contact between metabasalt of the Lamprey Falls Formation and a massive sulphide vein. The sulphides (pyrrhotite and minor pyrite) are moderately foliated and occur in a silica-enriched zone, together with basaltic and/or peridotitic fragments.

At least three different sulphide phases are evident under reflected light (Figure GS-18-3). Anhedral to euhedral pyrrhotite is dominant; however, occurring on the margins of the larger grains are similar-looking sulphides characterized by lighter colour and mottled texture with irregular fracture patterns. Small anhedral to euhedral pyrite grains occur within large quartz grains.

Economic considerations

The Maskwa property has been an exploration target since the early 1900s. Over 30 million pounds of Ni and nearly 1.5 million pounds of Cu have been mined from the Maskwa and Dumbarton properties to date (Harper, 2004). At present, an exploration program by Mustang Minerals Corp. is delineating additional Ni-Cu reserves (Mustang Minerals Corp., 2005).

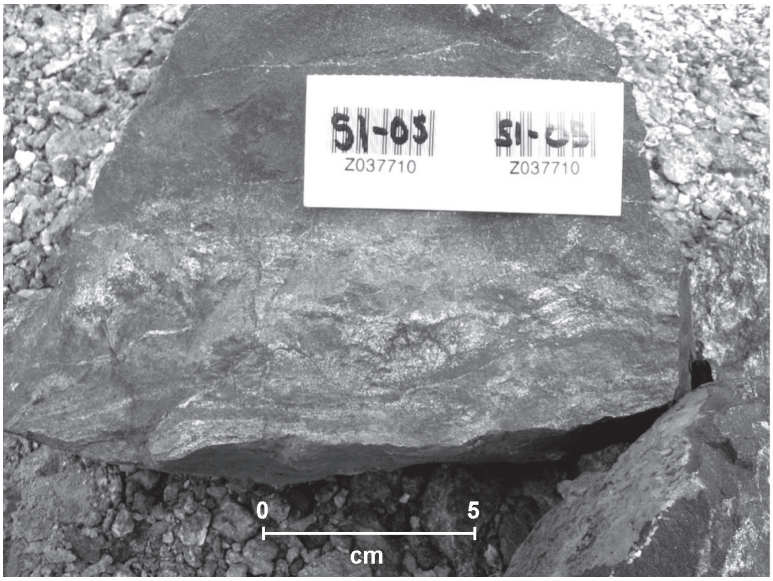

Figure GS-18-2: *Contact between a sheared massive sulphide vein and massive metabasalt of the Lamprey Falls Formation.*

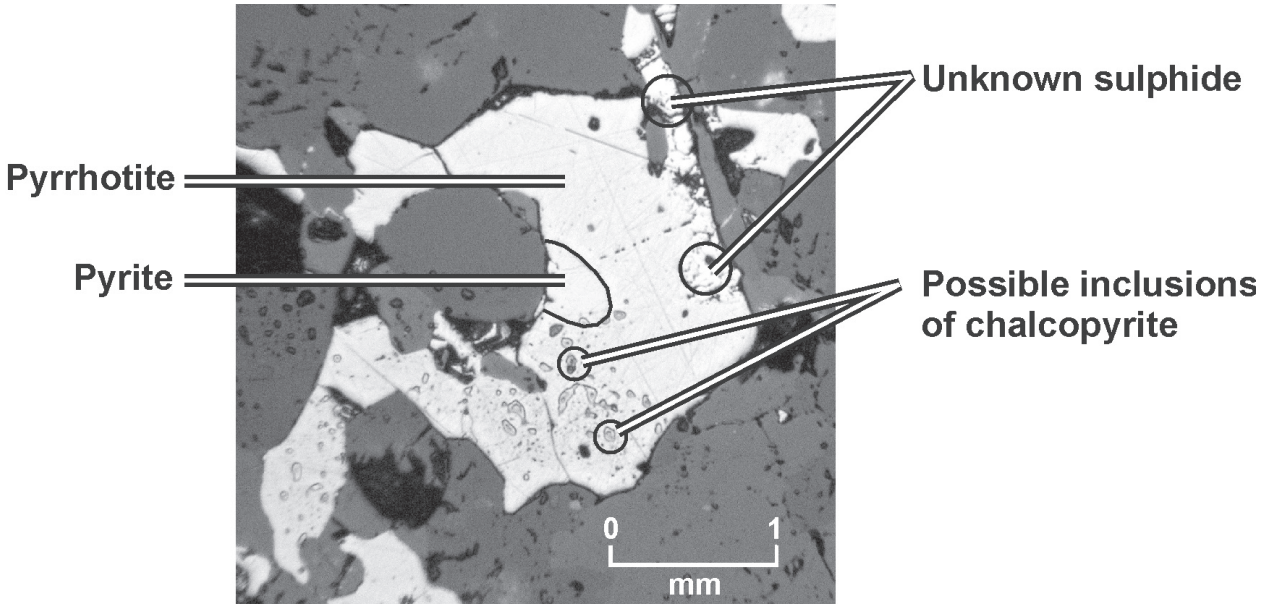

Figure GS-18-3: *Photomicrograph of part of a massive sulphide sample under reflected light, displaying pyrite and an unidentified mineral within a larger pyrrhotite grain*

Acknowledgments

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