CLEARCUT PYROXMANGITE/RHODONITE OCCURRENCE, GREENWOOD AREA, SOUTHERN BRITISH COLUMBIA (82/E2)

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INTRODUCTION

This report describes a new pyroxmangite-rhodonite occurrence visited briefly by the authors as part of a broader study of gemstones in British Columbia. The discovery is on the Clearcut claims, 1.5 kilometres northwest of Mount Roderick Dhu (lat. 49°12', long. 118°37'), 13 kilometres northeast of Greenwood (Figure 1).

Rhodonite is a manganiferous semiprecious stone valued for its pink to deep red colour. After jade, rhodonite is the second most important gemstone found in British Columbia. Lower quality material has ornamental applications such as sculptures, table tops and a variety of decorative items. Other occurrences in the province have been described by Leaming (1966), Danner (1976), Danner and Cowley (1980), Cowley (1979), Hancock (1992), Nelson *et al.* (1990) and others. Other pink manganese silicates that are difficult to distinguish from rhodonite are pyroxmangite and bustamite. It is possible that these minerals also occur in other previously known rhodonite occurrences but were not distinguished from rhodonite.

GEOLOGICAL SETTING

The northeast part of the Greenwood mining camp, in the vicinity of Mount Roderick Dhu and Jewel Lake (Figure 1), is underlain principally by a metamorphic complex tentatively assigned to the Knob Hill Group (J. Fyles, personal communication, 1995), the Wallace Creek batholith and Coryell intrusions. Mapping in the area has been done by Little (1983), Church (1986) and Fyles (1990).

The Knob Hill Group is an assemblage of pre-Mesozoic rocks forming an east-southeast trending belt extending from the lower course of Clement Creek to Jewel Lake and then to Mount Roderick Dhu. It comprises a variety of volcanic and sedimentary facies converted to amphibolite and quartz-mica schists. The rocks are medium to fine grained and medium to dark coloured. Primary structures, such as bedding, are often difficult to distinguish from foliation and gneissosity. The metasedimentary rocks consist of quartz (15 to 90%), plagioclase, biotite, some garnet and magnetite, and, less commonly, amphibole, chlorite, muscovite and occasionally andalusite (Church and Winsby, 1974).

The protolith of the quartz-rich metasedimentary rocks is difficult to determine because of recrystallization. The amphibolites generally occur as massive lenses, possibly derived from basaltic lava flows and pyroclastic rocks. Typically they consist of 40 to 70% green amphibole, and smaller amounts of plagioclase, quartz, magnetite and titanite. Epidote, calcite and quartz are present in small veins and fissures.

The Late Jurassic Wallace Creek batholith forms two large lobes underlying the area southwest of Jewel Lake and another area at the summit of Mount Roderick Dhu that extends westerly through the headwater basin of Clement Creek. These rocks are medium grained, medium grey and contain xenoliths of the metamorphic complex. Typically the rock consists of approximately 40% plagioclase, smaller amounts of quartz and potassium feldspar, approximately 10% amphibole and epidote, and accessory biotite, chlorite, apatite, titanite and magnetite.

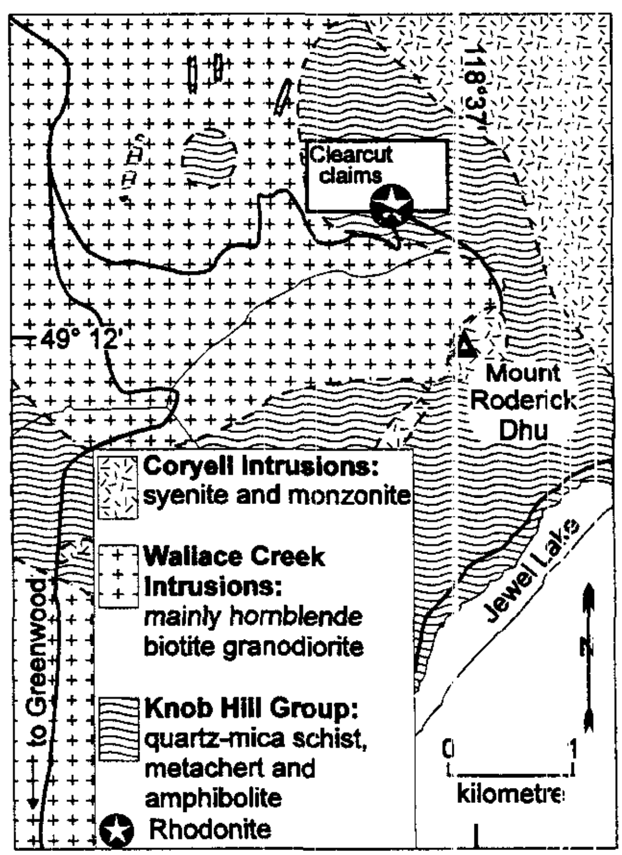

Figure 1: Location and geological setting of the Clearcut pyroxmangite/rhodonite occurrence. (Modified from Little, 1983).

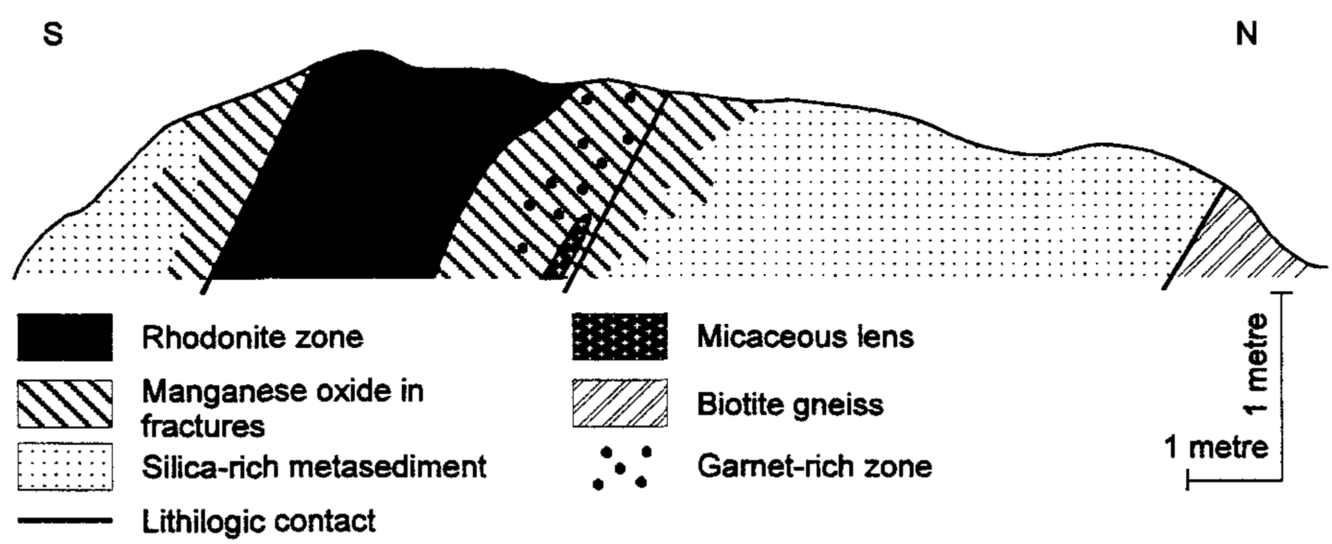

Figure 2: Cross section of the Clearcut pyroxmangite/rhodonite occurrence, looking west.

The Middle Eocene Coryell intrusions consist mostly of quartz-poor syenite and monzonite stocks and dikes occurring throughout the area.

DEPOSIT DESCRIPTION

The pyroxmangite-rhodonite showing is on the road leading to the microwave tower on Mount Roderick Dhu. The exposure, a road-cut section, is approximately 1 metre high and over 10 metres long. At surface much of the pink manganese silicate is altered and thickly coated with black manganese oxides. Manganese oxides in the proximity of rhodonite follow relatively closely spaced fractures. The section (Figure 2) is approximately perpendicular to the strike of the lithologic contacts. Better exposure is needed to fully document the contact relationships between manganese-bearing lithologies and surrounding rocks. The lithologies shown in the section are described below.

SILICA-RICH METASEDIMENT IN THE HANGINGWALL

Silica-rich metasediments in the hangingwall are light grey to light brown on fresh surfaces and black where weathered, due to a pervasive coating of secondary manganese oxides. The rock is massive, homogeneous and difficult to break. Weak, diffuse layering is observed in some specimens. No primary sedimentary textures, suggesting a clastic protolith, were observed. The rock is nearly monomineralic and consists mainly of quartz (>90%) with aggregates of idiomorphic to subidiomorphic spessartite garnets (<0.5%, <2 mm), accessory green amphibole(?; <0.5%, <1 mm), and slightly chloritized biotite (<0.5%, 2 mm). Boundaries between quartz grains are complex and strongly sutured. Some of the quartz shows wavy extinction. The presence of spessartite makes this rock similar to gondites (spessartite quartzite) they are commonly interpreted as metamorphic equivalents of manganese-bearing metacherts. Accessory minerals include manganese and iron oxides and pink manganese silicate, probably rhodonite and/or pyroxmangite. For simplicity, the term pyroxmangite/rhodonite is used throughout this paper to describe the pink manganese silicate. Approaching the manganese-rich zone, rhodonite becomes more abundant along quartz grain boundaries and microfractures. Along fractures rhodonite is oxidized and some of the garnet appears slightly chloritized. Carbonate minerals, probably manganoan calcite or rhodochrosite, are common in small concentrations, mainly as fracture fillings

PYROXMANGITE/RHODONITE-BEARING UNIT

Manganese silicate is pink and sugary. Locally it shows a variety of textures, ranging from coarse porphyroblasts that are up to several centimetres long enclosed in manganese oxides, to a fine mosaic consisting of quartz and pyroxmangite/rhodonite that appear to be in equilibrium, to nearly pure pyroxmangite/rhodonite characterised by an equigranular granoblastic texture (Photo 1). Pyroxmangite/rhodonite and quartz (<5 mm) are the major constituents of this unit. Their content varies from 30 to 90%.

Euhedral garnets, less than 0.5 millimetre in diameter, are the dominant accessory. Black, amorphous manganese oxides are more abundant in the pyroxmangite/rhodonite unit than in the silica-rich unit and are concentrated along fractures. Graphite flakes, 2 millimetres in cross-section, were observed along one

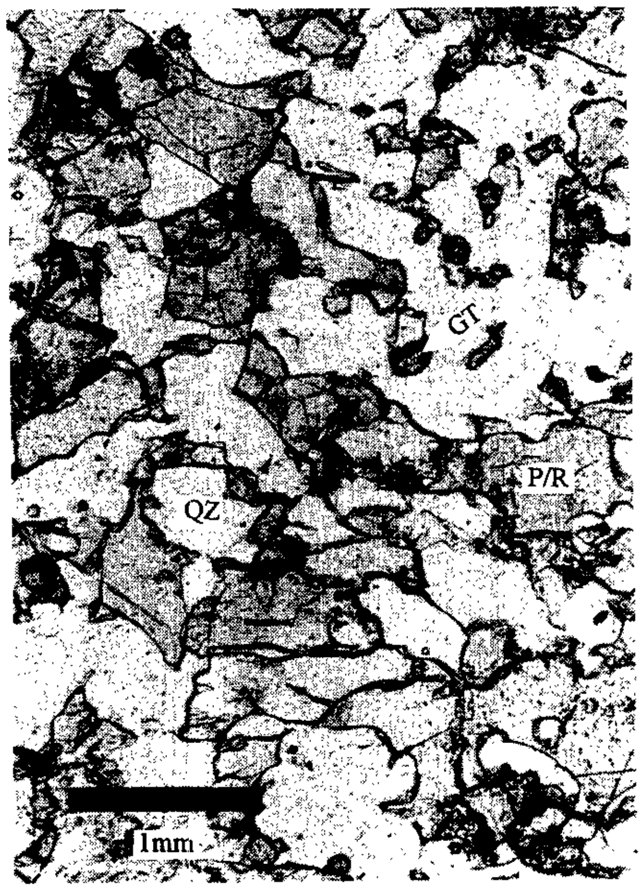

Photo 1: Microphotograph of pyroxmangite/rhodonite rock, Clearcut deposit. P/R = pyroxmangite/rhodonite; QZ = quartz; GT = spessartite.

black, manganese oxide filled fracture. Detailed microscopic, microprobe and geochemical studies that are in progress are needed to characterise this manganese-rich rock.

A manganese-garnet - quartz zone consists mainly of quartz (30-60%) and pyroxmangite/rhodonite (30-60%). An orange garnet is coarser and more abundant near the footwall where it forms lenses and streaks, less than 1 centimetre thick, containing up to 70% garnet. Garnet is readily identified on fresh surfaces. Individual garnet grains are subhedral and measure less than 0.5 millimetre in diameter. Overall the garnet represents less than 15% of the rock.

An amber-coloured micaceous lens, about 15 centimetres thick, is exposed for 50 centimetres near the base of the outcrop. It probably consists of phlogopite or vermiculite with individual flakes measuring up to 5 millimetres in diameter.

SILICA-RICH FOOTWALL ROCK

The silica-rich footwall unit is massive and consists mainly of interlocking quartz grains with strongly sutured grain boundaries. The quartz grains (up to 6 mm across) form over 90% of the rock, with subhedral garnet grains (<5 mm) forming less than 2%. Other accessory minerals are biotite (<0.5 mm) and iron oxide pseudomorphs after pyrite. As in the silica-rich hangingwall, there is no evidence of a detrital origin for the quartz, and it is probable that this rock was derived from a cherty protolith.

BIOTITE GNEISS

The northern limit of the pyroxmangite/rhodonite showing is strongly weathered gneiss. It probably corresponds to biotite gneiss observed 150 metres from the occurrence. The gneiss is grey on fresh surfaces and weathers brown. It is characterised by quartz-feldspar leucosomes, 2 to 5 millimetres thick, that form over 70% of the rock, separated by biotite-rich melanosomes, less than 1 millimetre thick, locally forming flaser textures. In places, this gneiss also contains some amphibole

SIGNIFICANCE OF THE CLEARCUT PYROXMANGITE/RHODONITE OCCURRENCE

Relatively poor exposure and the preliminary nature of this study do not permit definitive genetic conclusions. Nevertheless, the Greenwood pyroxmangite/rhodonite occurrence is associated with amphibolite, quartzite and gneiss that are probably metamorphic equivalents of volcanic rocks, siliceous chemical sediments, and pelitic lithologies, respectively. Such lithologies are commonly characteristic of rhodonite occurrences in the Sicker Group (Cowley, 1979) and are known in the Slide Mountain Terrane (Nelson *et al.*, 1990). The absence of primary detrital textures in the silica-rich hostrocks is consistant with a chemical precipitate protolith, either of sedimentary or hydrothermal origin. Many manganese deposits associated with chemical sediments of either volcanic or sedimentary affiliation are known worldwide (Laznicka, 1992) and some are considered distal equivalents of volcanogenic massive sulphide deposits. If this interpretation is correct, then the location of this occurrence farther east than any other in the province, is important from a regoinal point of view. It may be that the Clearcut occurrence formed in a depositional environment similar to manganese silicate occurrences to the west, including those in the Sicker Group on Vancouver Island, and possibly to the north in the Sylvester allochthon.

On the deposit scale, the pyroxmangite/rhodonite and associated quartzite polish well. However, largest pyroxmangite/rhodonite blocks in the exposed portion of the occurrence do not exceed 20 by 20 by 30 centimetres due to closely spaced joints and oxidation. Manganese deposits that originated as chemical precipitates are typicaly stratabound and commonly occur in clusters so adjacent areas may be prospective for rhodonite/pyroxmangite. However, it is not known if the rhodonite showing is related to an exhalative unit.

OTHER MANGANESE OCCURRENCES

Although manganese is uncommon in the Knob Hill Group, at least one other occurrence is known in the Greenwood area. It is a manganese-stained quartzite with pink manganese silicate (rhodonite?) and garnet, located at the top of the east-facing slope of Boundary Creek at an elevation of 1220 metres (J. Fyles, personal communication, 1995). No detailed prospecting has been recorded in that area.

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