GARNET SKARNS

K08

by Gerald E. Ray

IDENTIFICATION

SYNONYM: Pyrometasomatic or contact metasomatic garnet deposits.

COMMODITIES (*BYPRODUCTS*): Garnet (wollastonite, magnetite).

EXAMPLES (British Columbia - *Canada/International*): Mount Riordan (Crystal Peak, 082ESW102); *San Pedro (New Mexico, USA).*

GEOLOGICAL CHARACTERISTICS

CAPSULE DESCRIPTION: Garnet-dominant skarn hosted by calcareous rocks generally near an intrusive contact.

TECTONIC SETTINGS: Virtually any setting.

AGE OF DEPOSIT: May be any age.

HOST/ASSOCIATED ROCK TYPES: Garnet is hosted by carbonate or altered calcareous mafic volcanic sequences that are intruded by relatively oxidized plutons.

DEPOSIT FORM: Irregular zones of massive garnet developed in exoskarn close to plutonic contacts. The shape of the deposit may be controlled partly by the morphology of the original conformable units.

TEXTURES: Coarse grained, massive granoblastic textures in exoskarn.

ORE MINERALOGY (Principal and *subordinate*): Abundant and massive, coarse grained garnet (grossular-andradite) ± *wollastonite* ± *magnetite.*

ALTERATION MINERALOGY (Principal and *subordinate*): Garnet, *clinopyroxene, quartz, feldspar, calcite, sphene, apatite, axinite, vesuvianite and sericite.*

OPAQUE MINERALOGY: Economically viable garnet deposits typically have very little or no sulphides.

ORE CONTROLS: Plutonic contacts and oxidized carbonate host rocks. The Mount Riordan garnet skarn lies proximal to the intrusion.

ASSOCIATED DEPOSIT TYPES: Cu, Fe, Au and wollastonite skarns (K01, K03, K04 and K09).

COMMENTS: The best industrial garnets (due to higher specific gravity and hardness) are almandine-pyrope composition. These generally occur in high grade metamorphic rocks and require secondary concentration in beach or stream placers to be mined economically. Examples include the Emerald Creek deposit located in Idaho, USA, and a 6 Mt beach-sand deposit situated near Geraldton, Western Australia that grades 35 per cent garnet. The Mount Riordan deposit is one of the largest and highest grade garnet skarns yet identified; its garnet is suitable for the production of sandblasting and other abrasive products that require high angularity and a wide range of grain sizes. In British Columbia, there have been intermittent attempts to process the garnet-rich tailings from the Iron Hill-Argonaut Fe skarn (092F075).

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EXPLORATION GUIDES

GEOCHEMICAL SIGNATURE: May get very weak W, Mo, Zn and Cu geochemical anomalies.

GEOPHYSICAL SIGNATURE: Gravity and possible magnetic anomalies.

ECONOMIC FACTORS

GRADE AND TONNAGE: To be economic, garnet skarn deposits should be large tonnage (>20 Mt) and high grade (> 70% garnet). The Mount Riordan (Crystal Peak) deposit contains reserves of 40 Mt grading 78% garnet and San Pedro is a 22 to 30 Mt deposit with 85% andraditic garnet.

ECONOMIC LIMITATIONS: The garnet should be free of inclusions, possess a relatively high specific gravity and high angularity, and be present as discrete grains that can be processed easily by conventional benefication techniques. Economic concentrations of clean and industrially suitable grossularite-andradite garnet in skarn are rare. This is because skarn garnets tend to be relative soft and many contain fine-grained carbonate inclusions. Easy access, low cost transportation and a ready and reliable market for the product are essential features controlling the economic viability of a deposit.

END USES: Sandblasting, water-jet equipment and abrasives, such as sandpaper. Grossular-andradite garnets have more restricted uses than almandine.

IMPORTANCE: World production in 1995 of industrial garnet was approximately 110 000 tonnes, of which just under half (valued at $US 11 million) was produced in the U.S. Worldwide, most garnet is obtained from placer deposits or as a byproduct during hard rock mining of other commodities. The demand in North America for industrial garnet is growing; skarns are expected to be an important future source for the mineral.

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