Classification of Magnesite Deposits with Emphasis on the Mount Brussilof and Kunwarara Types

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Major magnesite deposits are hosted by sedimentary rocks and/or ultramafic rocks. Ultramafic rock hosted magnesite occurs mainly as talc-magnesite rocks (Simandl and Ogden, 1999) or as high grade "Kraubath-type" magnesite veins and stockworks (Zachman and Johannes, 1989, Paradis and Simandl, 1999).

Sedimentary deposits are the main source of magnesite. Two major sedimentary hosted deposit types covered by this paper are called "sparry" (Mount Brussilof - type) and "nodular/cryptocrystalline" (Kunwarara - type) deposits. Well documented examples of sparry magnesite deposits are the Eugui deposit in Spain (Lugli *et al.*, 2001), Mount Brussilof , Driftwood Creek and Marysville deposit of southeastern British Columbia (Simandl and Hancock, 1996 and Simandl *et al.* 1996) and Veitsch in Austria (Pohl and Siegl, 1986). Sparry magnesite deposits are typically stratiform or lens shaped and hosted by carbonates deposited on the continental platform. In many cases the magnesite bearing horizon can be traced for several kilometres to tens of kilometres along strike. The shortest dimension of the body may be few to tens of the metres thick. The magnesite-bearing rocks are characterized by pinolitic, zebra-like or xenotopic textures, monopolar and antipolar growths (Pohl and Siegl, 1986; Simandl and Hancock, 1991,1999 and Lugli *et al.*, 2001). Typical grades for sparry magnesite deposits are estimated at 90 to 95% magnesite with resource ranging from several to hundreds million tonnes. Although some of these deposits contain magnesite with an elevated iron content, magnesite from British Columbia deposits has very low iron in its crystal structure (Simandl and Hancock, 1996). High iron content adversely affects the refractory properties of the final product.

At Mount Brussilof, which is the only magnesite deposit currently in production in Canada, the high-grade ore is closely spaced drilled, sampled, selectively and selectively mined by open pit. Computer modeling, followed by controlled blasting helps to maximize the blending potential of the ore. Six daily production piles exist at any given time on the mine site, then the ore is tracked to the processing plant where it is blended again if required (Knuckey, 1998). Typical grades of marketed products are given in the Table 1.

Nodular cryptocrystaline magnesite deposits are also of major economic significance. The Kunwarara deposit in Queensland is an excellent example of this type. It is subhorizontal, extends over 63 km², and averages over 10 metres in thickness within a Tertiary sedimentary basin. Magnesite ore is overlain by dark humus-rich clay sediment. The waste to ore ratio is 0.4 to 0.5. The proven reserves at sites KG1, KG2 and KG3 are estimated at 18.6 million tonnes and total resource is estimated at 75.8 million tonnes including the nearby Oldman deposit (Queensland Metals Corporation Ltd, 2000). The grade estimates published earlier stated that ore consists of 20 to 95% by volume of magnesite nodules. Magnesite nodules range from 1mm to 50 cm in diameter and consist either of bone or porous magnesite. The analyses of the nodules (four representative samples) collected by Burban (1990) indicate 94.4-98.2% MgO, 0.82 - 2.04% CaO, 0.69 - 2.76 % SiO_2, 0.17 - 0.29 % Fe_2O_3, 0.08 -0.29% Al_2O_3 and 0.06 - 0.2 % MnO on LOI free basis. Boron content is 0.002%. The mining is carried out by open pit, no blasting is needed. The ore is washed, crushed, screened and further upgraded by scrubbing, heavy media separation and cyclones, and if required optical sorting. Other Kunwarara-type deposits are Yaamba and Triple Four deposits, the later is reported to contain 77 million tons of material containing 35 million tonnes of magnesite. Unbeneficiated magnesite nodules assay 92.3% MgO (Anonymous, 1987).

Both deposit types are a source of raw materials for calcined, deadburn and electrofused magnesia, magnesium hydroxide and other value-added products. They are proven to be good staring material for production of magnesium metal. Similar to at Baymag, the ore is carefully stockpiled.

Although the mining of the nodular type of deposits is cheaper because blasting is not required, processing of ore from this type of deposit is more complex relative to sparry magnesite deposit such as Mount Brussilof. Both sparry magnesite deposits and nodular deposits ores can be mined and transformed into products such as Mg metal, calcined, dead-burned and fused magnesia under current economic conditions..

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