GM 11218

NOTES ON MAGNESIUM, LIME AND LIMESTONE

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Énergie et Ressources naturelles
Québec

NOTES ON MAGNESIUM, LIME AND LIMESTONE

GENERAL

MINERALOGY

1- Magnesium obtained from minerals magnesite, brucite and dolomite.

Magnesite ($MgCO_3$) usually in white compact earthy masses.

Brucite ($Mg(OH)_2$) light coloured - generally foliated, sectile, has a pearly lustre.

Dolomite ($CaMg(CO_3)_2$) curved rhombohedral crystals, white to flesh pink colour.

2- Lime made by calcining limestone. Also it is often obtained as by-product in production of magnesium products e.g. from brucitic limestone near Wakefield.

Calcite ($CaCO_3$) rhombohedral crystals - white some blue, pink etc.

3- Limestone can be divided into 4 classes:

(A) high-calcium limestone, with 95% $CaCO_3$, -2% $MgCO_3$ and -3% impurities.

(B) calcium (ordinary) limestone with 10% $MgCO_3$.

(C) magnesium (dolomitic limestone with 10 to 40% $MgCO_3$.

(D) dolomite with 40 to 45.65% $MgCO_3$.

PUBLIC

QUEBEC DEPARTMENT OF MINES
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MINERAL DEPOSITS BRANCH
No G M- 11218

GEOLOGY

Deposits are large - quarry type of mining. Over 200 quarries are in operation in Canada in limestone that ranges in age from Precambrian to Jurassic. Limestone of Ordovician, Devonian and Silurian age are probably the most commonly quarried types.

PRODUCERS

Russia, Austria, Manchuria, Greece, Carchoslovakia, Yugoslavia, Korea (1945 figures).

USES

1- Magnesite after calcination (i.e. removal of CO_2) yields material for refractory bricks, cements and floors.

2- Brucite after calcination is used for making refractories.

3- Dolomite rock used as building or ornamental stone - for making of certain cements, in manufacture of magnesia bricks, when calcied used as a soft abrasive, also as a flux in blast furnaces.

4- Limestone is used as building stone; as road metal; in the prod. of cement; as concrete aggregate, railroad ballast, terrazzo, stucco and artificial stone, as a filler in asphalt, and in the prod. of lime.

Crushed ls. is used in agriculture for the improvement of soils, as an ingredient in glass and brick manufacture, and in asbestos roofing granules. Also used

as a whiting substitute and as poultry grit.

High-calcium ls. is used, in lumps, for the prep. of solution-making reactives in paper mills and as a flux in the metallurgical industry. This high-calcium limestone if low in impurities serves as a flux in the smelting of both ferrous and non-ferrous ores. This ls. is added, in at least small amts., to smelter charges of nearly all types, and in large proportions where the smelter charge would otherwise contain an excess of silica. (Therefore, the ls. should carry as little silica as possible). For use in iron furnaces, the S & P content of the ls. should be low (-0.5% S and -0.1% P for basic Fe, or -0.01% P for low-phosph. Fe).

Dolomitic ls., containing low impurities, is sometimes employed as a flux in the blast-furnace reduction of iron ores.

Dolomite may also be used in blast furnaces, particularly in the making of ferrosilicon and ferromanganese.

Limestones of Ordovician age, including beds of the Trenton, Black River, Chazy and Beckmantown (dolomite) formations, provide the greater part of the ls. quarried in Que. This ls. has a low content of mag. carb., and is therefore extensively used for the man. of Portland cement. It has also limited use as a flux, etc.

Limestone used for the man. of cement amounted to 2,980,000 T. in P.Q. in 1958. The 3 manufacturers were:

Canada Cement Co., Ltd., with quarries and plants at Montreal East and Hull; St. Lawrence Cement Co., with quarry and plant at Villeneuve, near Quebec city; and Ciment Québec, Inc., at Saint-Basile-de-Portneuf.

Quarries at St. Marc-des-Carrières supply a large portion of Que.'s ls. The remainder comes from quarries in the Lime Ridge, St. Hyacinthe and Gaspé regions. High-calcium ls. from near Bedford, P.Q. (E. twps.) has found use as a metallurgical flux.

The ls. quarry (one of the largest of its type in Canada) of Canada Cement Co., at Montreal E., has been opened in a member of the Trenton formation, which here is reported to have a possible th. of 285'. The quarry is about ½ mi. square, and has (1955) a 90-100' face. During 1955, it produced almost 1½ million tons of ls., all used in the co.'s cement manufacturing plant. A typical analysis runs 42.41% CaO, 2.10% MgO, 12.00% SiO_2, 5.32% R_2O_3 and 36.01% loss on Ignition. Daily production in 1960 was 5,000-6,000 tons/day.

The other quarry of this same co., on the northern outskirts of Hull, P.Q., is also located in the Trenton formation. Here the ls. is purer and has a higher lime content. In 1960, this quarry prod. 257,358 T. of ls. A typical analysis runs 51.30% CaO, 1.50% MgO, 4.66% SiO_2, 0.60% Al_2O_3, 0.22% Fe_2O_3 and 41.42% L.O.I.

The limestone quarry of the St. Lawrence Cement Co. is located 1 mi. N.E. of their plant at Villeneuve, P.Q. The formation quarried is again the Trenton, which here is about 200' th. A typical analysis of the higher-calc. beds of ls. runs 49.30% CaO, 2.35% MgO, 5.97% SiO_2, 2.60% Al_2O_3, 0.24% Fe_2O_3 and 40.14% L.O.I.

In 1958, apart from the ls. used in the cement ind. and in the making of lime, P.Q. prod. 12,948,048 T. of "construction" ls. (mainly crushed stone, with some building stone, rubble, etc). The province also prod. 458,944 T. of "industrial" ls. (mainly as agricultural ls. and ls. for use in the pulp and paper ind.), including 4,980 T. for use as a flux in the metallurgical ind. The value of ls. prod. as a flux in 1958 was $11,278.

Limestone for use as a flux in the metallurgical ind. has been produced from such quarries as that at Bedford, P.Q. (Shawinigan Chemical, Ltd.), and at Joliette, P.Q. (Standard Lime Co., Ltd.).

Lime is manufactured by the heating of ls. in kilns to a temp. of just over 900°C. Dolomite may also be used.

In 1958, 2,831,886 T. of ls. were used in Canada for the prod. of 1,596,422 T. of lime. Of this, P.Q. prod. 421,642 T. (both hydrated lime & quicklime). The majority of this provinces quicklime was used by the pulp and

paper industry, and the carbide and other industries. Most of the hydrated lime was used in non-ferrous smelters. Only a small amt. (1,271 T. of quicklime and 775 T. of hydrated lime) was used in iron and steel furnaces.

Of Canada's lime, a very large part found use in the uranium ind. (to neutralize waste sludges).

Lime is used (in the U.S.) as a flux in electric steel furnaces and in non-ferrous smelters. It is also used in the flotation process of ore dressing, and in cyaniding.

The most important lime producers of P.Q. are: A. Bousquet, of St. Dominique-de-Bagot; Dominion Lime, of Lime Ridge; and Standard Lime Co., Ltd., with kilns at Joliette and St. Marc-des-Carrières.

PRICE

In P.Q. (1957) crushed ls. for concrete aggregate sold at about $1.25-$1.50/T., at the quarry, (but quite variable). No price available for ls. used in the metallurgical industry.

CANADIAN PRODUCTION

1956 - mangnesite-dolomite and brucite - $2,412,000. (all from Que.).

1956 - magnesium and calcium - $5,617,826. (Que. and Ont).

1956 - lime - $15,328,917.

1- Magnesite and Hydro-magnesite at several localities in Western Canada, notably B.C. and the Yukon; not worked; either not extensive enough, or too remote; most important at Morysville, B.C.

2- Brucite - as granules in crystalline ls.; near Rutherglen, Ont., and near Wakefield, P.Q.; small deposit on W. Redonda Island, B.C.

3- Magnesitic-dolomite - most important deposit at Kilmar, Quebec; other occurrences in Eastern Townships.

4- Dolomite - near Renfrew, Ont.; dolomite beds of Grenville Series; worked by Dominion Magnesium.

5- Lime - as by-product in production of magnesia-brick from above minerals; also from limestone, or other calcareous rocks; quarried at many places in Canada; mainly P.Q., Ont., Man., Alberta, B.C. and N.B.

QUEBEC PRODUCTION

1- Magnesitic-Dolomite - few small occurrences in Botton and Sutton twps., in Eastern Twps.

2- High-Celcium limestone - quarried mainly at Bedford and Lime Ridge in Eastern Twps. and at Nouvelle in the Gasp. peninsula; most used as crude limestone for pulp-paper industry or as pulverized limestone for fertilizer; rest is pulverized or calcined and sold to chemical and

processing industries; at Bedford, goes to production of calcium carbide at Shawinigan Falls.

MONTREAL DISTRICT

1- Brucite (or brucitic limestone)

a) at Wakefield, P.Q., plant established in 1942 for extraction of brucite from mine at near-by Farm Point from brucitic limestone of Grenville Series; 9 large and about 12 small deposits over area of 4 square miles; operated by Aluminum Co. of Canada; some goes to magnesium; rest as refractories, as a fertilizer, and other industrial applications; quick-lime and hydrated lime is recovered in the process goes to Kilmar for refractories, and to Arvida for magnesium metal. The mining rate at Wakefield is about 9,000 tons per month.

Other occurrences of brucite:

b) Eardley twp. R. XIII, L. 14 - possibly 14,100 tons per vertical foot; fair recovery and good grade of concentrate is indicated. Property is in early development stage.

c) Hull, Grand Calumet and Masham twps. - many small outcroppings of brucite limestone.

2- Magnesitic-Dolomite - Kilmar Mine, near Lachute, Argenteuil Co. - several intermittent bands of varying width, forming zones 60' wide (±); mines since 1908;

worked now by Canadian Refractories, Ltd.; make a number of refractory products. Present miningrate is 300-350 tons/day.

3- Dolomite

a) Godmanchester twp. - R. III, L. 14, 34 and 38; minor quarrying done.

b) Litchfield twp. - R. X, L. 30 and 31; dolomite quarry Canadian Dolomite Co. (rept. of 1950).

c) also old dolomite quarry at Portage du Fort.

4- Dolomitic limestone

a) Campbell twp. - R. V, L. 7-8; Grenville dolomitic, limestone-outcrop with length of 400'.

b) Labelle twp. - R. I, L. 51 and 52; crystalline dolomitic limestone of very variable composition possibly important for magnesia content.

5- Limestone

a) Deschambault Quarry Corp. (St. Marc-des-Carrières) - but not oper. (at least, not under this name) since 1958; lot 1, St. Alban d'Alton par., (also had quarry on lot 12?); quarry measured (1952) 750' x 600' x 32' deep; formerly produced building stone, but in 1952 only crushed stone; in general, beds ~1' th., and separated by thin shaly interbeds.

b) J.O. Gauthier, Ltd. - lots 10 & 11, St. Alban d'Alton par. (near St. Marc district); quarry measured (1952) 1,500' x 450'; mostly mat for crushed stone; 1 d.d.h. (S.W. part of quarry) in 48' of ls., running 51.38-55.20% CaO, 0.45-1.44% MgO, 0.00-0.17% P_2O_5; 2nd. d.d.h. (1,760' N.E. of 1st) went from 16'-72' in ls., running 45.86-52.95% CaO, 0.50-1.15% MgO, 0.00-0.13% P_2O_5.

c) Gingras & Frères, Ltée - lot 9, St. Alban d'Alton par. (St. Marc district); quarry (in 1952) 600' long, with max. width of 340'; some large blocks of building stone quarried.

d) Bouthillier twp. - R. IV, lot 22; large exp. of Grenville (Precambrian) ls.; 52.79% CaO, 0.35% MgO and 27.2% SiO_2 and R_2O_3.

e) Campbell twp. - R. I, lots 8-13; a band of crystalline ls., about 500' wide; sample across width ran 46.42% CaO, 2.47% MgO and 12.11% SiO_2 and R_2O_3.

f) Gravel twp. - R. II, lots 7 & 8; large lense of xlline Grenville ls.; 45.60-51.11% CaO, 1.32-5.91% MgO and 1.93-11.98% insol., from 5 samples; poss. use as agricultural ls.?

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MONTREAL

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