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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

CENSUS OF INDUSTRY

MINING, METALLURGICAL & CHEMICAL BRANCH

THE
FELDSPAR & QUARTZ MINING INDUSTRY
IN
CANADA
1942

(including data relating to Nepheline-Syenite)



OTTAWA
1943

Price 25 cents

Canada

1914

THE

Canada

1914

(1914)

1914

Dominion Statistician:
 Chief - Mining, Metallurgical and Chemical Branch:
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THE FELDSPAR AND QUARTZ MINING INDUSTRY, 1942

Owing to the very close physical association of these minerals in many Canadian deposits (pegmatites), it has been found difficult for some operators to make a separation of all data pertaining to the mining of each individual mineral and, for this reason, the general statistics relating to capital, employment, fuel and electricity, etc., have been combined in this bulletin by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa. Since 1936, corresponding statistics relating to the production of nepheline-syenite have been included with those pertaining to the commercial production of feldspar and quartz.

During 1942 the gross value of production by the industry, and comprising the value of feldspar, quartz and nepheline syenite sold, totalled \$1,998,996 compared with corresponding values of \$1,838,054 in 1941 and \$1,508,999 in 1940. In 1942 commercial shipments of feldspar were made only from properties located in Ontario and Quebec; quartz (silica) in various forms was produced in Nova Scotia, Quebec, Ontario, Saskatchewan and British Columbia, while production of nepheline syenite was confined to the province of Ontario.

The number of firms reported as active in the industry in 1942 totalled 36; capital employed was recorded at \$2,563,248; employees numbered 533; salaries and wages amounted to \$782,903 and the value of fuel, electricity and process supplies totalled \$412,028. The net value of all products sold in 1942 was estimated at \$1,586,968 compared with \$1,587,071 in 1941.

FELDSPAR

Production (producers' sales) of feldspar, crude and ground, during 1942 totalled 22,270 net tons valued at \$213,941 compared with 26,040 net tons worth \$244,284 in 1941. Of the 1942 output, 16,802 net tons were shipped from Quebec properties and 5,468 net tons from quarries in Ontario. The following information is from a recent report issued by the Bureau of Mines, Ottawa:

"Most of the Canadian feldspar mined is of high-potash grade, though some operators also produce small amounts of high-soda spar. The latter type is rather uncommon as large deposits, but is sometimes found as zonal bodies in potash-feldspar pegmatites, especially along the walls.

"Most of the recorded production has come from adjacent sections of western Quebec and eastern Ontario, in the general Ottawa region, with a small amount, also, from scattered properties in Ontario as far west as the Parry Sound and Sudbury districts. Manitoba also formerly had a small production from the Winnipeg River district, but operations ceased there about six years ago. Formerly, a considerable part of the supply came from a number of small, scattered, and often intermittent operations, but in recent years most of it has come from a few larger deposits, the production being about equally divided between Ontario and Quebec. In 1942, however, the Ontario output declined to only about 30 per cent of the total.

"All of the feldspar used in industry is crushed or finely ground material, usually prepared either in mills operated by producers of the crude mineral or in merchant mills supplied from independent mines. Some manufacturers of ceramic products mine and grind spar for their own use.

"By far the greater part of the feldspar production is used in the ceramic industries, of which the glass trade is the largest consumer, followed by the pottery, enamel, and sanitary ware industries. In the United States, these industries used 98 per cent of total sales in 1940. Minor amounts are used in the manufacture of soaps and cleansers, abrasive wheels, and artificial teeth. A novel use recently proposed for feldspar is for smothering incendiary bombs, and has been patented by the United States Government. A low-fluxing, soda type of spar is preferred, free of material finer than 200-mesh, and is claimed to have extinguishing properties superior to common sand or any special mixtures recommended for such purpose.

"Domestic feldspar prices in 1942 showed no change from previous years. Quotations for No. 1 grade crude continued at \$5.50 to \$6.00 per ton, f.o.b. rail, for domestic mills and export. Ground spar, 200-mesh, sold at \$16 to \$18, and granular glass spar at \$12, both f.o.b. mill, in carload lots.

"Crude feldspar entering the United States pays a duty of 25 cents per long ton. The duty on ground feldspar is 15 per cent ad valorem."

Table 1 - PRODUCTION OF FELDSPAR IN CANADA, BY PROVINCES, 1930-1942

Year	QUEBEC		ONTARIO		MANITOBA	
	Tons	\$	Tons	\$	Tons	\$
1930	17,074	163,802	9,722	104,667	...	...
1931	10,581	86,842	7,962	100,119	...	...
1932	3,390	39,063	3,657	42,920	...	...
1933	6,183	59,283	4,587	45,350	88	484
1934	9,207	78,853	7,302	61,665	1,793	6,763
1935	7,002	63,075	8,656	75,003	2,084	6,252
1936	8,115	75,703	8,409	70,840	1,322	7,952
1937	12,285	105,612	9,061	72,610	...	...
1938	5,874	62,878	8,106	65,964	78	451
1939	5,399	60,923	7,061	51,056	40	330
1940	8,548	89,004	12,907	96,619	...	...
1941	14,218	137,160	11,822	107,124	...	...
1942	16,802	164,588	5,468	49,353	...	...

Table 2 - FELDSPAR CONSUMED IN SPECIFIED CANADIAN INDUSTRIES, 1940 and 1941

Industries	1940		1941	
	Tons	\$	Tons	\$
Abrasive products	68	2,056	84	3,127
Imported clay products	3,305	70,788	3,333	74,247
Soaps and cleaning preparations	1,085	11,427	3,593	34,411
Iron and steel products	542	9,774	(x)	15,683
Glass	350	5,744	909	16,656
Enamelling materials	400	6,000	523	7,845

(x) Quantity statistics not available.

NEPHELINE-SYENITE

Producers' sales of nepheline syenite were valued at \$246,893 in 1942 compared with \$227,583 in 1941. Commercial production of nepheline syenite in Canada is confined to Eastern Ontario. Shipments during the year under review were made by the American Nepheline Corporation Limited and the Canadian Flint & Spar Company Limited. The first-named company operated its quarry located on Lot 14, Concession 9 of Methuen township, Peterborough county, throughout the year, milling operations were steady and the company marketed its products in both the crude and refined state. Canadian Flint & Spar Company Limited carried on quarrying operations at its property located near Bancroft from May to November; the output from this quarry was shipped in the crude state to the United States.

The following information was abstracted from a report prepared by the Bureau of Mines, Ottawa:

"Nepheline syenite is a quartz-free crystalline rock consisting essentially of the mineral nephelinite, a silicate of alumina, potash, and soda, with albite and microcline feldspar. It often contains varying amounts of iron-bearing minerals in the form chiefly of black mica and magnetite, together with such accessory minerals as zircon, corundum, calcite, scapolite, etc. It has no free silica, and is high in alumina (20 to 30 per cent in average commercial rock) as compared with straight feldspar (17 to 20 per cent), and it has thus found favour with the ceramic industries, particularly in the glass trade. For ceramic use the crude rock must be freed of its iron-bearing constituents, removal of which can often be readily effected by a relatively cheap process of magnetic separation at about 20-mesh size.

"Nepheline syenite continues to be used chiefly in the glass trade where it is preferred to straight feldspar because of its higher content of alumina. Most Canadian glass plants now use the material and it is also employed by a number of American plants. Some American feldspar grinding establishments use the syenite for blending with their granular glass spar. It is claimed that 1,500 pounds of syenite will replace 2,000 pounds of spar in the glass batch on the basis of relative alumina content and the higher content of alkalis reduces the temperature of melting, with resultant saving of fuel and longer tank life. Research has been proceeding steadily on applications for nepheline syenite in other branches of ceramics and it has been found of advantage owing to its higher fluxing action as a body ingredient in a variety of products, including pottery, semivitreous ware, sanitary and electrical porcelain, floor and wall tile, and structural clay products, as well as enamels. Increased vitrification, translucency, and mechanical strength, improved glaze fit, and reduced absorption, warpage, thermal expansion, and crazing, are among the desirable properties claimed for the various types of ware made from it.

"Interest has been shown in the possibility of employing nepheline syenite as a source of alumina for the aluminium industry to replace bauxite, all of which is imported. Frobisher Exploration Company, Limited (Ventures) conducted an intensive geological and diamond drilling program in 1941 on the nepheline syenite occurrences of the Bancroft area, Ontario and test work has been proceeding in the laboratories of the Bureau of Mines, Ottawa, on methods of treating the rock for recovery of the contained alumina, potash, and soda. Large deposits of nepheline syenite are also known to exist on the north shore of Lake Superior.

"The fine dust product resulting from the processing of Lakefield syenite is used as a substitute for pumice, for grinding and polishing, and in the cleanser, enamelware, and heavy clay industries.

"Glass-grade nepheline syenite for sale in Canada remained at the 1941 price of \$11.75 per ton, bulk, in carload lots, f.o.b. Lakefield, with ground, 200-mesh, ceramic grade quoted at \$16.50. Grade B (dust) sold for \$13.00 l.c.l. American prices also remained unchanged, at \$12.00 for glass grade, and \$15.50 for ceramic grade, all bulk, in carload lots, f.o.b. Rochester, New York."

Table 3 - PRODUCTION OF NEPHELINE-SYENITE IN CANADA (x), 1936-1942

Year	Quantities	Value
		\$
1936	(a)	57,426 (b)
1937	(a)	121,481
1938	(a)	142,737
1939	(a)	140,148
1940	(a)	117,849
1941	(a)	227,583
1942	(a)	246,893

(x) Produced in Ontario only.

(a) Quantity not published.

(b) First commercial production in Canada.

Nepheline-syenite used in Canada in the manufacture of glass totalled 3,472 tons valued at \$58,629 in 1939, 4,235 tons at \$69,619 in 1940, and 5,854 tons worth \$94,091 in 1941.

QUARTZ (SILICA)

The production of natural silica or quartz in Canada during 1942 totalled 1,738,174 short tons valued at \$1,538,162 compared with 2,052,878 tons at \$1,366,187 in 1941. Output of primary silica products by the Canadian quartz mining industry includes crude and crushed dyke quartz, quartzite, sandstone and natural silica sands and gravels. The mineral in one or more of the forms thus defined was produced during 1942 in Nova Scotia, Quebec, Ontario, Saskatchewan and British Columbia. Shipments of silica in Nova Scotia were made to steel plants largely for the making of silica brick. In Quebec, high-grade silica sands were produced for the manufacture of glass and chemicals while a considerable tonnage of these same sands was sold for sand-blasting and various other purposes; in the same province relatively large quantities of crushed quartzite were mined and milled for the manufacture of silicon carbide and other products. The greater part of the tonnage of silica shipped in Ontario during 1942 represented material intended for use in the production of silica brick and ferro-silicon and for the fluxing of nickel-copper ores. Quartz production as recorded for Saskatchewan represented low-grade natural silica sands or gravels shipped as flux to the Flin Flon smelter of the Hudson Bay Mining and Smelting Co. Ltd. Production in British Columbia in 1942 consisted of quartz shipped to the Trail smelter from the Gypo and Ballarat deposits located near Penticton.

The price per ton of the several grades of silica varies greatly depending on its purity and on the purpose for which it is to be used. Silica generally is a low-priced commodity, and therefore the situation of a deposit with respect to markets is of great importance. The largest markets for silica are in the provinces of Quebec and Ontario, and new deposits to be of interest to these markets should be within economic reach of either Toronto or Montreal. In Western Canada the main markets are in Alberta and Manitoba.

Quotations as given by "Canadian Chemistry and Process Industries" are: silica sand, various grades, in car lots \$9 to \$9.50 a ton; silica, quartz, 99 per cent, 110-220 grade, in car lots, \$14 to \$20 per ton.

QUARTZ CRYSTAL
(United States Bureau of Mines)

"Modern mechanized warfare depends upon instantaneous two-way radio communication, which to be effective must rely upon accurately ground wafers of crystal, two in each circuit; dozens are needed for a single tank or airplane. Brazil remains the only known commercial source of quartz suitable for radio-frequency control, and radio quartz crystal has been classified as a strategic mineral by the Army and Navy Munitions Board.

"Quartz crystals of commercial size, found near Hot Springs, Ark., almost without exception show twinning, and crystal plates made from them do not have piezoelectric properties unless the twinned portion is cut away--a costly process. Cracks and inclusions of other minerals and of air render most domestic crystals and fragments subject to rejection, even before examination for piezoelectric properties.

"In Brazil, the annual production of quartz crystal jumped to over 1,000 short tons in 1940 from about 250 tons in 1937. One-fourth of the output is consumed as piezoelectric (radio) quartz, and the remainder is used as optical, instrument, or fusing quartz. Before 1941 Japan's purchases were the backbone of the Brazilian crystal industry. The United States had comparatively small peacetime requirements and bought only high-grade material.

"In 1941 the Governments of the United States and Great Britain agreed to buy all stocks of Brazilian quartz crystals remaining after their nationals had made purchases for private industry. The Brazilian Department of Mineral Production, Ministry of Agriculture, introduced export control through licenses and levied a 10 per cent tax based upon export prices. Exports may clear only through the ports of Rio de Janeiro and Salvador.

"A schedule of prices for the various grades of crystal as of April 1941 has been reported. For example, "A" (piezoelectric)-grade crystals weighing 1.5 to 2.0 kilograms with growth faces were quoted at 250,000 milreis a kilogram (about \$6, United States currency, a pound). Owing to tremendous increases in demand and slight revision in specifications for oscillator plates, many of the manufacturers began to use smaller crystals down to 200 grams each. Prices of larger crystals advanced as much as threefold during the year, but even at the peak these represented only a minor factor in the cost of the final product."

No commercial production of quartz crystals has ever been officially reported in Canada. Imported crystals, however, are now being cut and dressed in the Dominion.

According to a report issued by the Engineering and Mining Journal, New York, April, 1943, an inspection laboratory has been established in Rio de Janeiro, Brazil, by the United States Signal Corps for the selection of suitable quartz crystals. Deposits of quartz crystals have been worked in four regions in Brazil, including the poorly accessible Tocantins River district. Veins are located by independent pick-and-shovel prospectors who mine the crystals by crude hand methods. Quartz rock crystals for fusing, all sizes, were quoted in the United States, April, 1943--\$100 to \$150 per ton. Prisms for piezoelectrical and optical use command a substantial premium.

In 1943 it was reported that the Rare Minerals Prospecting Syndicate was developing a quartz crystal property located in Leeds county, Ontario.

Table 4 - PRODUCTION IN CANADA OF QUARTZ, 1941 and 1942

	1 9 4 1		1 9 4 2	
	Short tons	Value	Short tons	Value
		\$		\$
PRODUCTION(x) (SHIPMENTS) -				
Nova Scotia	11,477	24,100	10,708	23,557
Quebec	147,318	388,948	203,219	543,817
Ontario	1,745,244	599,667	1,367,733	914,256
Saskatchewan	148,208	51,873	155,699	54,495
British Columbia	631	1,579	815	2,037
CANADA	2,052,878	1,366,187	1,738,174	1,538,162

(x) Includes both crude and crushed quartz, crushed sandstone and quartzite, and natural silica sands.

Table 5 - PRODUCTION(x) (USE) OF NATURAL LOW-GRADE SILICA SAND AND SILICA GRAVEL AS NON-FERROUS SMELTER FLUX
1940-1942

	1 9 4 0		1 9 4 1		1 9 4 2	
	Tons	\$	Tons	\$	Tons	\$
Ontario	1,403,268	491,144	1,533,392	536,597	644,529	225,585
Saskatchewan	159,090	55,681	148,208	51,373	155,699	54,495
CANADA	1,562,358	546,825	1,681,600	588,560	800,228	280,080

(x) Included in totals shown in Tables 4 and 6; also, complete data for production of this material in Ontario previous to 1936 are not available.

Table 6 - PRODUCTION OF QUARTZ (SILICA) IN CANADA, 1929-1942

Year	Ton	\$	Year	Ton	\$
1929	265,949	561,527	1936 (x)	1,046,649	597,781
1930	226,200	418,127	1937 (x)	1,377,448	1,129,011
1931	195,724	303,158	1938 (x)	1,380,011	961,617
1932	189,152	276,147	1939 (x)	1,582,935	1,100,214
1933	185,783	297,820	1940 (x)	1,858,302	1,203,527
1934	272,563	482,265	1941 (x)	2,052,878	1,366,187
1935	233,002	424,882	1942 (x)	1,738,174	1,538,162

(x) See footnote to Table 5.

PRICES - UNITED STATES (May, 1941 to April, 1943) - Silica, per ton, water ground and floated, in bags, f.o.b. Illinois: 325 mesh, \$21 to \$40 for 92 to 99 per cent grades. Dry ground, air floated, 325 mesh, 92 to 99 per cent silica, \$18 to \$30. Glass sand, f.o.b. producing plant, \$1.25 to \$5 per ton; moulding sand, 50 cents to \$5.50; blast sand, \$1.75 to \$6. California: \$5 for quartz and \$2.50 for sand. Quartz rock crystals for fusing, all sizes, \$100 to \$150 per ton; prisms for piezoelectrical and optical use command premium. (Engineering and Mining Journal's "Metal and Mineral Markets" - New York).

Table 7 - CONSUMPTION OF QUARTZ, SILICA SAND, ETC., IN CANADA, BY INDUSTRIES, ACCORDING TO CENSUS OF INDUSTRY REPORTS, 1941(x)

Industry	Quantity	Cost at works
		\$
Silica sand and silica (including ground quartz) -		
Soaps and cleaning preparations	4,347	92,870
Acids and salts	24,327	109,402
Paints	1,019	39,365
Refractories	578	7,252
Roofing paper	2,641	15,135
Abrasives (silica sand)	57,362	269,605
Abrasives (quartz)	174	6,624
Glass	114,761	713,677
Enamelling materials	595	8,925
Products from imported clays	4,055	63,116
Foundry facings and supplies	99	1,242
Non-ferrous smelters (x)	1,682,231	590,139
Steel industry (silica sand)	82,701	573,305
Ferro-alloys (quartzite)	164,390	390,619
TOTAL ACCOUNTED FOR	2,139,280	2,881,276

NOTE: Consumption values are costs at works.

(x) The quantities reported under this industry usually contain low-grade natural/silicious sands used for fluxing purposes.

(x) In addition to the quantities shown, a relatively large quantity of quartz and quartzite is consumed in the manufacture of silica brick.

Data not yet complete for 1942.

Table 8 - PRINCIPAL STATISTICS OF THE FELDSPAR AND QUARTZ MINING INDUSTRY, 1942 and 1941

		ONTARIO (x) (b)		QUEBEC	
		1942	1941	1942	1941
Number of firms (a)		17	18	19	20
Capital employed	\$	1,452,823	650,405	1,110,425	1,664,177
Number of employees - On salary		24	17	22	15
On wages		234	207	253	267
Total		258	224	275	282
Salaries and wages - Salaries	\$	39,186	25,210	52,081	26,927
Wages	\$	333,791	253,443	357,845	304,909
Total	\$	372,977	278,653	409,926	331,836
Selling value of products (gross)	\$	1,290,591	1,311,946	708,405	526,108
Cost of fuel and purchased electricity	\$	53,261	42,709	70,839	48,456
Cost of process supplies	\$	204,167	97,954	83,761	61,864
Net value of sales	\$	1,033,163	1,171,283	553,805	415,788

(x) In 1940 includes 1 firm operating in Nova Scotia and 1 in Saskatchewan (a total of 2). In 1941 and 1942 includes 1 firm in Nova Scotia, 1 in British Columbia and 1 in Saskatchewan; data only for Nova Scotia are complete.

(a) Small shippers from whom reports were unobtainable and whose production is recorded from consumers' returns are sometimes not included in the total.

(b) Includes data relating to production of nepheline-syenite.

Table 9 - NUMBER OF WAGE-EARNERS ON PAY ROLL, BY MONTHS, 1941 and 1942

Table 3 - NUMBER OF WAGG-BEARINGS ON THE ROLL, BY MONTH, 1941 and 1942								
Month	1941	Quebec			Ontario			CANADA (x)
		Surface	Under-ground	Mill	Surface	Under-ground	Mill	
January	230	155	53	64	126	24	16	458
February	297	166	46	65	127	24	18	446
March	336	142	32	65	128	23	59	449
April	432	130	27	66	151	15	58	447
May	553	181	27	80	159	20	62	546
June	579	161	30	81	172	24	58	544
July	587	157	17	80	178	19	65	531
August	604	144	10	85	176	29	66	526
September	551	159	13	83	178	12	62	522
October	537	152	12	91	162	12	63	507
November	549	151	4	82	149	11	61	473
December	477	128	4	68	119	..	28	362

(x) Includes a few employees in some months in Nova Scotia. Complete data relating to quartz production in British Columbia in 1941 and 1942 are not available.

Table 10 - WAGE-EARNERS WORKING THE HOURS SPECIFIED DURING ONE WEEK IN MONTH OF HIGHEST EMPLOYMENT, 1942

Hours	Number	Hours	Number
30 hours or less	47	49-50 hours	11
31-43 hours	33	51-54 hours	45
44 hours .....	...	55 hours	6
45-47 hours	28	56-64 hours	161
48 hours	173	65 hours and over	104
Grand Total Employees in week specified ...			608
Total wages paid in week specified			\$ 16,412

Table 11 - FUEL AND ELECTRICITY USED, 1942 (b)

Kind	Unit of measure	CANADA		Ontario (a)		Quebec	
		Quantity	Cost at works	Quantity	Cost at works	Quantity	Cost at works
			\$		\$		\$
Bituminous coal -							
Canadian	short ton	1,064	8,992	3	30	1,061	8,962
Foreign	short ton	3,591	26,240	3,588	26,192	3	48
Anthracite coal -							
United States	short ton	1,437	15,585	...	...	1,437	15,585
Other	short ton	1	15	1	15	...	...
Coke	short ton	10	141	10	141	...	...
Gasoline	Imp. gal.	69,170	19,543	34,391	8,887	34,779	10,656
Kerosene	Imp. gal.	779	157	734	149	45	8
Fuel oil	Imp. gal.	191,536	22,051	57,700	6,943	133,836	15,108
Wood	cord (A)	458	2,060	297	1,138	161	922
Gas - Manufactured	M cu. ft.	...	...	...	...	...	...
Other fuel .....	...	...	...	...	...	...	...
Electricity purchased	K. W. H.	3,619,708	29,316	1,939,433	9,766	1,680,275	19,550
TOTAL .....	...	...	124,100	...	53,261	...	70,839
Electricity generated for own use	K. W. H.	1,753,959	...	142,959	...	1,611,000	...

(A) 128 cubic feet.

(a) Includes data for 1 property in Nova Scotia.

(b) Data relating to production of silica flux by some smelting companies are included with those of the non-ferrous smelting and refining industry and the sand and gravel industry.

Table 12 - POWER EQUIPMENT INSTALLATION, 1942

Description	QUEBEC		ONTARIO (x)	
	Number	Horse power	Number	Horse power
<u>Ordinarily in Use</u>				
Steam engines and steam turbines .....	...	...	8	508
Diesel engines	4	605	3	337
Other internal combustion engines	14	685	13	676
Electric motors operated by purchased power ...	56	1,116	42	1,073
Electric motors operated by establishment power	108	1,148	5	19
Stationary boilers	2	75	7	595
Motor generator sets	2	15	4	232
<u>In Reserve or Idle</u>				
Steam engines and steam turbines .....	...	...	...	...
Diesel engines	2	422	...	...
Other internal combustion engines	1	40	...	...
Electric motors operated by purchased power ...	6	73	2	75
Electric motors operated by establishment power	3	12
Stationary boilers	1	50

(x) Includes 1 property in Nova Scotia.

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