Barite and Witherite

Michel Dumont

The author is with the Minerals and Metals Sector, Natural Resources Canada.
Telephone: 613-995-2917
E-mail: mdumont@nrcan.gc.ca

Mineralogically, barite (barium sulphate, $BaSO_4$) resembles celestite (strontium sulphate mineral, $SrSO_4$), not only in crystal habit, hardness and colour, but also chemically to some degree. Barium can substitute for strontium since the atoms have a similar ionic radius. Barite is also referred to as barytes or baryte.

The only other commercially available barium mineral is witherite (barium carbonate, $BaCO_3$). Witherite is a rare mineral, primarily since it easily alters to barite. It alters when sulphuric acid from sulphide minerals dissolves the witherite and the sulphur combines with the barium and forms barite. However, in some localities, such as Illinois in the United States, it occurs in relative abundance as new specimens are formed from calcite that lose calcium to barium, thus forming witherite.

Barite is most commonly coarse grained; it also occurs as platy crystals or fine-grained compact masses that may be white, light yellow, light grey, brown, pink or blue. When pure, barite contains up to 58.8% barium, the balance being mainly sulphate, or carbonate. A commercially important characteristic of barite is its specific gravity of 4.5 g/cm^3. Although heavy, it is soft with a hardness of 2.5 to 3.5 on the Mohs scale (i.e., a fingernail cannot scratch it, a copper penny may or may not, but a knife blade will). Some barite deposits may be classified as hard or soft depending on the ease with which the mineral may be ground. Although barite contains a heavy metal (barium), it is not a toxic chemical since it is relatively insoluble in water and acid, and therefore can be used as a chemically inert material.

Inclusions of other minerals may reduce the specific gravity of barite, but a high density, chemical inertness and widespread occurrences are the properties that are valued for barite's most important application as a weighting agent in drilling fluids. Colour and chemical purity are important properties when considering the suitability of barite for small non-drilling higher-value applications such as fillers in marine and industrial paints, in brake lining/friction materials, and in plastics. It is also important in the manufacture of paper, glass and rubber, and is used in radiology for X-rays of the digestive system.

Barite Deposits in Canada

Barite deposits have been found in all provinces except Alberta, Saskatchewan and Prince Edward Island. More than 150 deposits have been identified in Canada and many of these are small and of limited commercial interest; however, some have been developed as producing mines.

Barite deposits can be classified into three groups: vein, replacement and residual. There are no known residual deposits in Canada. Residual deposits are formed by the weathering of barite-bearing rocks and consist of barite fragments in a layer of soil or clay. The barite is derived from vein or replacement bodies in soft sedimentary host rocks. Barite fragments from sand size to boulder size are usually concentrated in a zone overlying the source of barite.

Most of the known Canadian barite occurrences are of the vein type. The vein deposits in the Atlantic provinces contain barite that is mostly coarse grained with a platy texture. The barite-fluorite veins that comprise the Lake Ainslie system (Nova Scotia) are developed along strong fault cavities and subsidiary tension fractures. The majority of the veins are concentrated in three specific areas east of Lake Ainslie. The barite vein deposits of Ontario are compact, coarsely granular and massive. Barite from the Kootenay district of British Columbia varies from friable and finely granular to compact and platy, to fine grained and compact. Most domestic production has come from replacement deposits, which are similar in many respects to vein deposits but which replace in whole or in part certain beds of sedimentary formation. Limestone is often the host rock and these deposits are usually more extensive than vein types, although the $BaSO_4$ content may not be as uniform or as high. There are four main replacement orebodies in Canada: the Walton orebody in Nova Scotia, the

Giant Mascot and Mineral King orebodies in British Columbia, and the Buchans orebody in Newfoundland and Labrador.

With respect to witherite, there are not many localities for this mineral, but a small deposit exists at Thunder Bay, Ontario.

CANADIAN SUPPLIERS

Newfoundland and Labrador

Barite has been produced intermittently in this province, most recently by Phoenix Minerals in 1998-99 (from small open-pit operations at Collier Point, Trinity Bay, and by Pennecon Ltd.), who in 1999 produced 35 000 t of barite and celestite from a quarry at Boswarlos in the western part of the province. Barite production was mostly sold as a weighting agent for the drilling mud used in petroleum exploration.

In 2001, Buchans Barite Co. Ltd., a private company, was awarded a three-year contract to supply barite to M-I LLC for the offshore drilling market after the withdrawal of United Bolero Development Corp. Buchans Barite was hoping to restart the barite mill in Buchans using material recovered from the Buchans base-metal tailings pile in Red Indian Lake located in the central part of the province. The deposit contains 1.5 Mt of recoverable material grading 30% barite. The product was going to be shipped to a toll grinding facility in Musquodoboit, Nova Scotia (at the Mosher Limestone plant), where it was to be ground to M-I's specifications.

Atlantic Barite Ltd. is in the process of restarting a barite mill, also located in Buchans. The company was awarded a contract to supply 10 000-20 000 t/y of drilling-grade barite. The mill processes tailings from a former copper-lead-zinc operation.

Nova Scotia

E-Z-EM Canada, Inc. (Nystone Division) is the only barite producer in Nova Scotia. Nystone has a barite-siderite deposit in early carboniferous sediments located 1.6 km northeast of Brookfield at Upper Brookfield, Colchester County. During 1997, the surface mine was dewatered and approximately 1497 t of ore were mined from the pit that was crushed and screened. All of the material that had previously been mined and stockpiled at the mine was trucked to the company's plant at Debert. The mill circuit at the plant consists of gravity separation, magnetic separation, acid leaching, and ultra-fine grinding in a paddle mill to produce USP pharmaceutical-grade barium sulphate with a minimum purity of 97.7% that sells for over $1200/t. During 2002, there was no production from the surface mine; however, 2369 t were processed at the company's plant. This product was shipped to the parent company, E-Z-EM, Inc., in Westbury, New York, until 2004, where it was prepared and packaged into barium kits that were sold to hospitals and medical clinics. Therapex in Montréal, Quebec, now replaces the Westbury plant for the global market. Nystone production is currently ongoing, although less than previous years, since formulations for medical barium kits require a lot less barium.

Lynx Minerals Corp. of Trenton had acquired the mineral rights and purchased the surface rights for the Lake Ainslie barite-fluorite deposit (on Cape Breton Island) from Conwest Exploration Company Ltd. In 1998, Lynx produced and sold 5000 t (reserves of 200 000 t) of mud-grade barite and sold this production in 1999 for the offshore drilling market before suspending operations. In 2002, Atlantic Industrial Minerals Inc. (AIM) of Halifax had entered into a memorandum of understanding to acquire the assets of Lynx but, in 2004, AIM decided not to proceed with its previously announced purchase of Lynx Minerals Inc.

Quebec

Although not a producing barite mine, Therapex (Division and Trademark of E-Z-EM Canada Inc., a global leader in the manufacture of barium products) is a provider of turnkey outsourced drug development and manufacturing services that produces high-purity barite for pharmaceutical use (main medical use is barium meals for X-rays of the intestinal tract); the company obtains its natural barite from Nystone, Nova Scotia, and also precipitated barite from Germany. Supply negotiations are in process with a third potential source in the United States. In 2004, E-Z-EM, Inc. closed its Westbury, New York, operations where it prepared and packaged barium kits sold to hospitals and medical clinics around the world and transferred all of its activity to Therapex in Montréal.

Ontario

Extender Minerals of Canada produces approximately 12 000 t of barite annually from the North Williams underground mine (brown barite vein deposit-type) located in Shining Tree and from processing operations close to Matachewan near Kirkland Lake. The company produces barite powder and aggregate (grades 93-97%) for the friction, plastic, rubber, paint, adhesives, casting and other specialized industries.

Cimbar Performance Minerals of Cartersville, Georgia, has acquired the barite business of Dynatec Corporation of Richmond Hill, Ontario. The deal includes the customer list and the Sparwite trade names, but no physical assets. Both companies process barite imported from China. Dynatec will continue to process talc and dolomite at Marmora, Ontario. The Richmond Hill facility now produces all of its high-end barite (barium sulphate) filler products for the high-end manufacturing industries in the United States and South America that were previously

produced by Mountain Minerals Division (i.e., paints and plastics grades).

Alberta

Heemskirk Canada Ltd. of Calgary (previously Dynatec's western Canadian industrial minerals assets) operates a barite processing plant at Lethbridge. The product is used mainly in drilling muds. All of the barite comes from the U.S. state of Nevada. The company has announced plans to expand capacity at its processing plant in Lethbridge where an added mill will process primary barite to meet the accumulated demand from western Canada's oil and gas industry.

British Columbia

Dynatec Corporation operated an underground barite mine in Parson that closed in 1999. The ore from the mine was shipped to the processing plant at Lethbridge, Alberta. The product was used mainly in drilling muds, but also in paints and plastics.

Fireside Minerals Inc. of Red Deer, Alberta, operates a high-grade white barite mine near the Yukon border in a poorly exposed area in the Liard Plain and a processing plant at Watson Lake (125 km west of the mine), located in the Yukon. In 2001, Fireside mined 18 000 t of barite from the Bear vein at the Fireside mine; 15 000 t was also mined from the West Bear pit. The barite produced is suitable for filler applications or for use in drilling mud. The Fireside mine used jigs to recover 10 000 t of barite for the northwestern B.C. and Alberta oil and gas drilling industry. In 2002, Fireside shipped only 1500 t. In recent years, production has been intermittent.

MINING AND PROCESSING

Commercial barite is mined from surface or near-surface deposits by open-pit or underground mining methods. The broken ore is trucked to the processing plant where it may be washed by log washer or trommel screen to remove adhering clay and low-grade fines before reduction by jaw or impact crusher to 25 cm or finer for further processing. The degree of further processing and concentration depends on the grade of ore, identified end use, and liberation size (i.e., the size at which the barite is essentially free of contaminating impurities). If further size reduction is required, this can be accomplished by jaw, impact, cone or roll crushers.

The concentrated barite may be ground to final size specifications by roller mill, paddle mill or other suitable unit. A 45-micron product is normally specified for drill-mud barite; however, a much finer product may be required for other applications, such as chemical and pharmaceutical preparations.

CANADIAN SHIPMENTS, CONSUMPTION AND TRADE

Preliminary data (Table 1) reported by Canadian producers for 2005 indicate shipments were valued at $4.4 million, almost a $0.5 million decrease from the revised 2004 value of $4.5 million, for a quantity of 23 179 t (an increase of 2578 t from 2004). Table 3 demonstrates that shipments from 1998 have declined dramatically (from 86 159 t in 1998 to 20 992 t in 2000) and stabilized in the 20 000-t range. The U.S. Geological Survey's 2003 review on barite shows that Canada's rank fell to 22nd place in 2004 with 21 000 t, compared to its previous 8th place ranking in 1999 in terms of barite production. Global production (Table 4) for 2004 was estimated at over 7.2 Mt, led by China with 3.9 Mt followed by India with 723 000 t and the United States with 532 000 t.

Preliminary imports (Tables 1 and 3 "HS 2511.10 - natural barium sulphate - barite only") were valued at $12.3 million for 2005, an increase of almost $4.7 million from 2004, with an increase in quantity of imports from 82 888 t in 2004 to 115 968 t in 2005. The bulk of imports was supplied by the United States with 83 639 t (72.1%) valued at $8.8 million (71.9%). As can be seen in the statistical tables, imports of barite increased dramatically (827.3%) during the 1998-2005 period (i.e., from 12 506 t to 115 968 t).

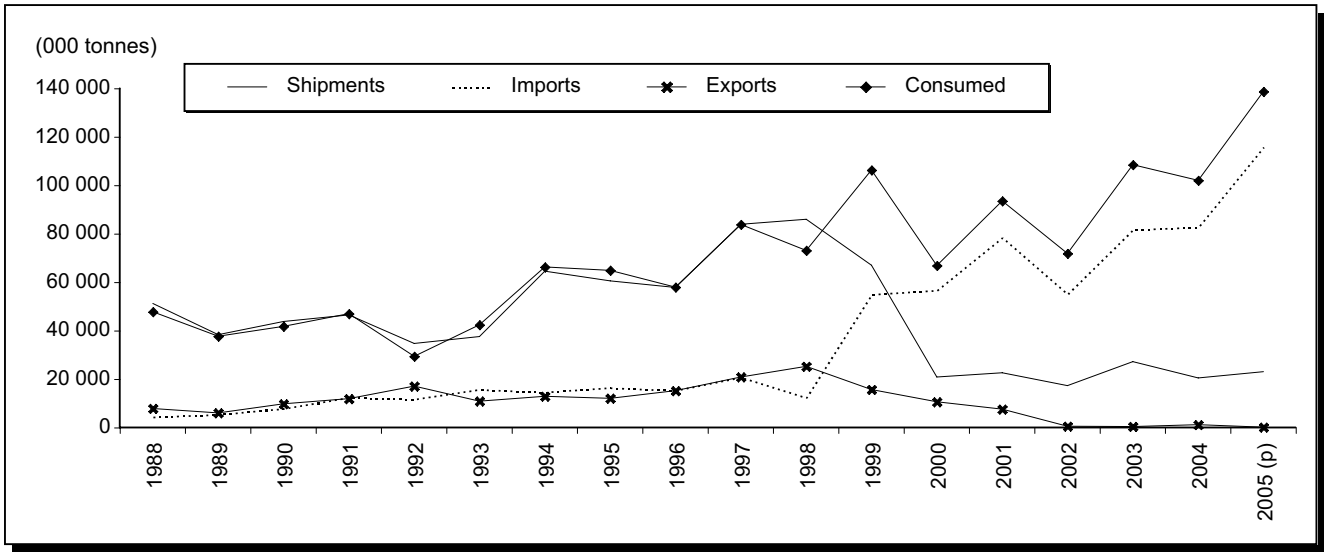
Preliminary imports (Tables 1 and 3 "HS 2511.20 - natural barium carbonate - witherite only") were valued at $1.9 million for 2005, an increase of almost $1.1 million from 2004; the quantity imported also increased from 1821 t in 2004 to 4129 t in 2005.

As for the balance of imports (barium/strontium compounds), quantities increased to 23 605 t in 2005 from 19 465 t in 2004, with values of $14.8 million and $13.5 million, respectively.

Preliminary exports (Tables 1 and 3 "HS 2511.10 - natural barium sulphate - barite only") were valued at almost $126 000 for 2005, a major decrease of almost $1.0 million from the revised 2004 value of $1.2 million; the quantity exported also decreased from 1310 t in 2004 to 281 t in 2005. The bulk of exports was delivered to the United States, amounting to 106 t (37.7%) valued at almost $46 000 (36.5%). As can be seen in Table 3, exports of barite have decreased continuously since the 1998 peak of 25 395 t to the low of 572 t in 2003, to rebound slightly in the preliminary reported figures of 1310 t for 2004 and then declined again in 2005 to 281 t.

Canada has no production of natural barium carbonate (witherite); therefore, it does not export any. Nevertheless, the balance of export (barium/strontium compounds) quantities decreased to 203 t for 2004 from 1287 t in 2003, with values of $2.2 million and almost $1.3 million, respectively.

Figure 1
Barite Statistics and Trends, 1988-2005



Source: Natural Resources Canada.
(p) Preliminary.

The apparent use of barite and witherite in Canada (Table 3) has increased from 102 179 t in 2004 to 138 866 t in 2005 (a 35.9% increase), a change in direction from the 108 650 t in 2003. However, the reported use (Table 2) of both barite and witherite by industry sector differs in this trend, since an increase in consumption from 28 820 t in 2003 to 55 531 t in 2004 is reported via the voluntary yearly survey conducted by Natural Resources Canada.

PRODUCTION AND MARKET CONSIDERATIONS

Barite originates in many countries. Various grades of barite are suitable for use in chemical markets, pigment applications, industrial fillers, and drilling muds. The economics of drilling barite's low delivered cost rule out many of the world's known deposits.

There is a direct relationship between barite demand and oil/gas exploration and production drilling activity, which in turn depends on the present and projected price of oil and, to a lesser extent, on demand for gas. Reports of world drill rig counts are the main criteria for evaluating the potential demand for barite. Drilling activity is highly volatile.

Most barite is ground to a small uniform size before it is used as a filler, extender or additive in industrial products, or as a weighting agent in petroleum well-drilling mud based on specifications set by the American Petroleum Institute (API).

PRICES

Oil and gas price levels are linked to factors like the state of the world economy, international politics, and changes in technology related to fuel burning.

According to *Industrial Minerals*, mid-year international barite prices were as follows: paint grade micronized, ex-works USA, min. 95%, US$275-$325/t; and drilling grade API, lump, c.i.f. U.S. Gulf Coast, US$64-$69/t.

MAJOR USES AND SPECIFICATIONS

Barite is used for both its physical attributes, such as relatively high specific gravity and/or chemical inertness (drilling mud additive, construction, functional filler), and for its chemical properties (source of BaO and chemical feedstock).

The principal worldwide uses of barite in 2004 (source: *Industrial Minerals' "*World Metals & Minerals Review 2005") are estimated as 88% as an additive in drilling fluids; 6% for chemicals, fillers, extenders and aggregates; and 6% for ceramic and glass.

OUTLOOK

North America's energy demand has been driving up demand for drilling-grade barite as oil and gas exploration has increased. Drilling for oil and gas both onshore and offshore is booming.

With China being the principal source of barite for U.S. drillers, demand for barite from China is so great that lower-grade reserves are being mined. While there is a large number of small Chinese mining companies, only a few key traders and direct exporters supply the main consumers in Europe and North America. Chinese production (source: February 2004 *Industrial Minerals* magazine) of drilling-grade barite is centred in Guangxi Province while much of the non-drilling-grade ore is mined in Guizhou in the Guiyand City area. Exports are still almost all lump barite with grinding conducted in the countries of consumption. The leading North American consumer of Chinese non-drilling barite is Cimbar Performance Minerals in the United States. In Canada, Dynatec imports lump barite for its Mineral Products Division from Guizhou. The best Chinese white barite is unequaled in terms of quality and available volume worldwide, so to fill any significant gap in the tonnages currently exported to Europe and North America would be a challenge.

Nevertheless, rising prices for Chinese drilling-grade barite as a result of high ocean freight rates, port congestion, hampered overland logistics, and the lowering of the value-added tax rebate on barite exports from China have made some North American suppliers competitive again in the drilling mud market.

Canada does not produce barite chemicals such as barium carbonate, barium oxide, barium chloride and barium nitrate. Specialized applications for barite offer little scope for significantly increased use. In these markets, barite tends to be chosen in preference to other minerals because it is cheap and readily available. The ability of barite to block X-rays (second only to lead) and the fact that it is the only X-ray-opaque material that is safe to use in the human body have led to the development of new applications.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 65. (2) Information in this review was current as of June 30, 2006. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/com_e.html.

NOTE TO READERS

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TARIFFS

Item No.	Description	Canada			United States	EU	Japan
		MFN	GPT	USA	Canada	Conventional Rate (1)	WTO (2)
25.11	Natural barium sulphate (barytes); natural barium carbonate (witherite), whether or not calcined, other than barium oxide of heading no. 28.16						
2511.10	Natural barium sulphate (barytes)	4.5%	Free	Free	Free	Free	Free
2511.20	Natural barium carbonate (witherite)	Free	Free	Free	Free	Free	Free
2816.40	Oxides, hydroxides and peroxides, of strontium or barium	Free	Free	Free	Free	5.5%	3.3%-3.9%
2827.39.20	Chlorides, chloride oxides and chloride hydroxides; bromides and bromide oxides; iodides and iodide oxide: other chlorides: other: of barium	4%	Free	Free	Free	5.5%	3.3%-3.9%
2833.27	Sulphate; alums; peroxosulphates (persulphates): other sulphates: of barium	Free	Free	Free	Free	5.5%	3.9%
2834.29	Nitrites; nitrates: nitrates: other	Free-5.5%	Free-3%	Free	Free-5.5%	3%	Free-3.9%
2836.60	Carbonates; peroxocarbonates (percarbonates); commercial ammonium carbonate containing ammonium carbonate: barium carbonate	Free	Free	Free	Free	5.5%	3.9%

Sources: Canadian *Customs Tariff*, effective January 2006, Canada Border Services Agency; *Harmonized Tariff Schedule of the United States,* 2006; *Official Journal of the European Union* (October 27, 2005 Edition); *Customs Tariff Schedules of Japan, 2006*.
(1) The customs duties applicable to imported goods originating in countries that are Contracting Parties to the General Agreement on Tariffs and Trade or with which the European Community has concluded agreements containing the most-favoured-nation tariff clause shall be the conventional duties shown in column 3 of the Schedule of Duties. (2) WTO rate is shown; lower tariff rates may apply circumstantially.

TABLE 1. CANADA, BARITE PRODUCTION AND TRADE, 2003-05

Item No.		2003		2004		2005 (p)	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
PRODUCTION (Shipments)							
	Nova Scotia	x	362	x	755	x	225
	Ontario	x	3 000	x	2 000	x	2 000
	British Columbia	x	1 770	x	1 750	x	2 200
	Total	27 369	5 132	20 601	4 505	23 179	4 425
EXPORTS							
2511.10	Natural barium sulphate (barytes)						
	United States	406	508	920	959	106	46
	Ecuador	30	14	119	58	60	37
	Chile	120	79	80	47	66	27
	Argentina	–	–	28	10	28	10
	China	10	4	6	2	12	3
	Brazil	–	–	4	1	9	3
	United Kingdom	6	2	–	–	–	–
	Cuba	–	–	120	73	–	–
	Russian Federation	–	–	33	14	–	–
	Total	572	607	1 310	1 164	281	126
2816.40	Oxide, hydroxide and peroxide of strontium or barium						
	Turkey	..	4	–	–	..	2
	Czech Republic	..	2	–	–	–	–
	Latvia	..	...	–	–	–	–
	South Africa	..	2	–	–	–	–
	Total	..	8	–	–	..	2
2827.39	Other chlorides: other						
	Philippines	–	–	..	1 711	..	2 831
	United States	..	68	..	23	..	731
	Germany	–	–	..	36	..	664
	Japan	..	113	..	85	..	267
	China	–	–	–	–	..	54
	Belgium	–	–	..	6	..	14
	Taiwan	–	–	–	–	..	7
	Venezuela	–	–	–	–	..	6
	Israel	..	3	–	–	..	5
	United Kingdom	–	–	–	–	..	5
	India	–	–	–	–	..	4
	Mexico	..	1	..	1	..	1
	Indonesia	–	–	–	–	..	1
	Dominican Republic	–	–	..	...	..	...
	Cuba	..	22	–	–	–	–
	France	..	10	..	9	–	–
	South Korea	..	1	–	–	–	–
	Malaysia	–	–	..	3	–	–
	Norway	–	–	..	136	–	–
	Suriname	–	–	..	...	–	–
	United Arab Emirates	–	–	..	...	–	–
	Total	..	218	..	2 010	..	4 590
2833.27	Other sulphates: of barium						
	Switzerland	–	–	–	–	17	11
	Brazil	2	1	–	–	–	–
	Total	2	1	–	–	17	11
2834.29	Nitrates: other						
	Kuwait	–	–	–	–	154	283
	United States	693	1 060	198	224	125	142
	Mexico	...	...	...	1	...	1
	Taiwan	–	–	–	–	...	...
	Saint Pierre and Miquelon	...	...	–	–	–	–
	Japan	–	–	4	10	–	–
	Russia	–	–	1	2	–	–
	Suriname	–	–	...	...	–	–
	Total	693	1 060	203	237	279	426
2836.60	Barium carbonate						
	Trinidad and Tobago	...	...	–	–	–	–
	Total exports	1 267	1 894	1 513	3 411	577	5 155

TABLE 1 (cont'd)

Item No.		2003		2004		2005 (p)	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
IMPORTS							
2511.10	Natural barium sulphate (barytes)						
	United States	38 858	4 772	63 508	6 211	83 639	8 867
	China	31 885	2 513	18 575	1 242	32 066	3 368
	Netherlands	607	173	670	169	262	105
	Algeria	–	–	2	...	1	...
	Germany	2	1	–	–	–	–
	Morocco	10 500	947	–	–	–	–
	Austria	–	–	133	10	–	–
	South Africa	–	–	..	...	–	–
						–	–
	Total	81 852	8 406	82 888	7 632	115 968	12 340
2511.20	Natural barium carbonate (witherite)						
	Morocco	3 361	1 498	1 819	818	3 918	1 806
	Brazil	–	–	–	–	107	48
	India	–	–	–	–	104	47
	China	25	12	–	–	...	...
	Hong Kong	–	–	...	...	...	...
	Italy	–	–	–	–	..	...
	Taiwan	–	–	–	–	...	...
	Germany	10	5	–	–	–	–
	United States	1	...	2	1	–	–
	Total	3 397	1 515	1 821	819	4 129	1 901
2816.40	Oxide, hydroxide and peroxide of strontium or barium						
	Germany	75	76	296	287	284	280
	Italy	307	180	184	131	247	168
	United States	440	331	148	84	143	96
	China	536	319	40	36	83	60
	Japan	...	...	4	3	19	16
	Denmark	–	–	–	–	...	...
	India	...	...	...	...	–	–
	Belgium	–	–	...	...	–	–
	Total	1 358	906	672	541	776	620
2827.39.20.10	Barium chloride, to reduce level of radium in liquid from uranium production						
	Mexico	...	...	...	...	...	...
	United States	2	1	...	...	...	...
	China	55	34	–	–	–	–
	Germany	1	...	–	–	–	–
	Japan	1	1	–	–	–	–
	India	–	–	...	...	–	–
	Total	59	36	...	...	...	...
2827.39.20.90	Other barium chlorides						
	China	291	272	218	303	827	408
	United States	115	162	90	158	109	149
	Japan	1	8	1	3	1	5
	Germany	1	5	1	4	1	4
	India	...	...	2	9	...	1
	Denmark	–	–	–	–	...	1
	Mexico	...	...	...	...	...	...
	Austria	5	22	–	–	–	–
	Canada	–	–	2	8	–	–
	Sweden	–	–	...	...	–	–
	Total	413	469	314	485	938	568
2833.27	Other sulphates: of barium						
	Germany	2 606	2 011	2 508	2 498	3 538	3 712
	United States	260	247	622	480	169	159
	Italy	43	37	93	64	98	82
	Japan	58	56	44	44	41	44
	China	...	...	–	–	4	5
	Ireland	1	1	–	–	1	1
	Switzerland	–	–	...	...	...	...
	United Kingdom	6	7	...	...	–	–
	Total	2 974	2 359	3 267	3 086	3 851	4 003

TABLE 1 (cont'd)

Item No.		2003		2004		2005 (p)	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
IMPORTS (cont'd)							
2834.29	Nitrates: other						
	United States	2 954	4 503	4 612	3 936	6 373	3 442
	China	2 573	1 839	1 977	1 903	1 991	2 455
	Norway	770	1 212	2 625	1 017	2 993	997
	Chile	201	116	462	226	228	121
	France	80	131	27	64	57	105
	Mexico	5	103	5	90	4	101
	Israel	395	254	227	110	128	55
	Sweden	–	–	44	137	58	54
	Japan	23	42	34	44	33	52
	Netherlands	8	5	46	22	108	50
	Poland	36	26	319	194	63	48
	Germany	10	16	17	35	12	28
	India	28	65	2	8	1	5
	Brazil	–	–	–	–	1	4
	United Kingdom	2	3	1	1	. . .	3
	Switzerland	1	2	1	2	. . .	1
	Indonesia	–	–	–	–	1	1
	Hungary	–	–	. . .	. . .	. . .	. . .
	Macedonia	–	–	. . .	. . .	. . .	. . .
	Singapore	–	–	–	–	. . .	. . .
	Italy	17	410	–	–	–	–
	Portugal	21	33	10	17	–	–
	South Africa	1	1	–	–	–	–
	Turkey	3	7	–	–	–	–
	Czech Republic	10	20	–	–	–	–
	Azerbaijan	–	–	. . .	. . .	–	–
	Belgium	–	–	19	18	–	–
	Ireland	. . .	6	–	–	–	–
	Total	7 138	8 794	10 428	7 824	12 051	7 522
2836.60	Barium carbonate						
	United States	1 975	842	1 762	822	2 244	1 057
	China	2 898	779	2 958	736	3 694	1 027
	Japan	1	. . .	12	6	31	15
	India	–	–	–	–	20	14
	Germany	67	32	41	16	–	–
	Italy	–	–	3	1	–	–
	Total	4 941	1 653	4 776	1 581	5 989	2 113
	Total imports	102 132	24 138	104 166	21 968	143 702	29 067

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . Not available; . . . Amount too small to be expressed; (p) Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, REPORTED USE OF BARITE, 1999-2004

Reported Use (1)	1999	2000	2001	2002	2003	2004
			(tonnes)			
Well drilling	x	x	x	x	x	x
Paint and varnish	x	x	x	x	x	x
Other products (2)	8 753	8 577	6 295	5 751	4 198	4 309
Total	15 161	16 062	27 517	14 840	28 820	55 531

Source: Natural Resources Canada.
x Confidential.
(1) Available data reported by consumers. (2) "Other products" include plastics, bearings and brake linings, nonferrous smelting and refining, etc.
Note: Numbers may not add to totals due to rounding.

TABLE 3. CANADA, BARITE AND WITHERITE, PRODUCTION, TRADE, AND APPARENT USE, 1988-2005

Year	Production (1)	Imports (3)	Exports (3)	Apparent Use (2)
		(tonnes)		
(NACIS 2511.10 Natural barium sulphate "barytes" only)				
1988	51 450	4 529	8 022	47 957
1989	38 511	5 539	6 214	37 836
1990	43 906	7 966	9 928	41 944
1991	46 614	12 572	12 052	47 134
1992	34 870	11 905	17 221	29 554
1993	37 712	15 920	11 065	42 567
1994	64 701	14 776	13 054	66 423
1995	60 662	16 616	12 229	65 049
1996	57 967	15 472	15 352	58 087
1997	84 091	20 958	21 038	84 011
1998	86 159	12 506	25 395	73 270
1999	67 161	55 149	15 838	106 472
2000	20 992	56 797	10 751	67 038
2001	22 780	78 639	7 727	93 692
2002	17 417	55 273	682	72 008
2003	27 369	81 853	572	108 650
2004	20 601	82 888	1 310	102 179
2005	23 179	115 968	281	138 866

Sources: Natural Resources Canada; Statistics Canada.
NACIS North American Industry Classification System.
(1) Mine shipments. (2) Production plus imports less exports. (3) Includes HS code 2511.10.
Note: Numbers may not add to totals due to rounding.

TABLE 4. BARITE AND WITHERITE, WORLD PRODUCTION BY COUNTRY, 2003 AND 2004

Country	2003	2004	Change	Global Rank
	(tonnes)		(%)	
China	3 500 000	3 900 000	11	1
India	675 000	723 000	7	2
United States	468 000	532 000	14	3
Morroco	356 394	357 000	0	4
Mexico	287 451	300 000	4	5
Iran	180 000	204 000	13	6
Thailand	115 600	125 000	8	7
Turkey	119 648	120 000	0	8
Germany	109 500	110 000	0	9
Vietnam	81 456	101 040	24	10
Bulgaria	95 000	95 000	0	11
France	81 000	82 000	1	12
North Korea	70 000	70 000	0	13
Russia	60 000	60 000	0	14
United Kingdom	59 000	60 000	2	15
Brazil	55 000	55 000	0	16
Algeria	45 649	47 945	5	17
Spain	44 660	45 000	1	18
Kazakhstan	40 000	40 000	0	19
Italy	25 000	25 000	0	20
Pakistan	25 000	25 000	0	21
Canada	23 000	21 000	-9	22
Australia	20 000	20 000	0	23
Laos	18 070	18 000	0	24
Georgia	15 000	15 000	0	25
Slovakia	14 000	14 000	0	26
Saudi Arabia	9 000	10 000	11	27
Romania	2 000	8 000	300	28
Nigeria	5 000	5 000	0	29
Argentina	3 261	3 500	7	30
Poland	3 000	3 000	0	31
Peru	2 906	2 906	0	32
Afghanistan	2 000	2 000	0	33
Bolivia	1 851	2 000	8	34
Bosnia and Herzegovina	1 851	1 900	3	35
Tunisia	3 000	1 800	-40	36
Burma	2 000	1 000	-50	37
Greece	800	800	0	38
Colombia	600	600	0	39
Egypt	500	500	0	40
Chili	229	230	0	41
Guatemala	100	100	0	42
Others	28474	31679	11	n.a.
Total	6 650 000	7 240 000	9	

Source: U.S. Geological Survey, *2004 Review on Barite* , estimated production for 2004.
n.a. Not applicable.