

BAUXITE AND ALUMINA

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Bauxite is a naturally occurring, heterogeneous material comprised primarily of one or more aluminum hydroxide minerals plus various mixtures of silica (SiO_2), iron oxide (Fe_2O_3), titania (TiO_2), aluminosilicates (clay, etc.), and other impurities in trace amounts. The principal aluminum hydroxide minerals found in varying proportions within bauxite are gibbsite [$\text{Al}(\text{OH})_3$] and the polymorphs, boehmite and diaspore [both $\text{AlO}(\text{OH})$].

Bauxite is typically classified according to its intended commercial applications such as abrasive, cement, chemical, metallurgical, and refractory. Of all bauxite mined, approximately 85% is converted to alumina (Al_2O_3) for the production of aluminum metal, an additional 10% goes to nonmetal uses as various forms of specialty alumina, and the remaining 5% is used for nonmetallurgical bauxite applications. The bulk of world bauxite production is, therefore, used as feed for the manufacture of alumina via a wet chemical caustic leach process known as the Bayer process. The majority of the alumina produced from this refining process is smelted using the Hall-Héroult process to produce aluminum metal by electrolytic reduction in a molten bath of natural or synthetic cryolite (NaAlF_6).

Specifications for the nonmetallurgical grades of bauxite are more stringent than those for bauxite used to produce metal and are based on the processing requirements and special properties required of their final commercial products. The natural chemical impurities that exist within these specialty-grade raw materials are not chemically removed from the ore during refining as is the case for metallurgical-grade bauxite. Nonmetallurgical ores in an essentially unrefined chemical form are used as direct feed for the production of their ultimate end products. Although figures on bauxite production and consumption within nonmetallurgical markets are not commonly available, the principal industrial end uses for nonmetallurgical-grade bauxite are considered to be in refractories and abrasives, followed by cement applications. In addition, the aluminum chemicals and steel industries also consume significant quantities of bauxite.

In 1998, 23 countries reported bauxite mine production, and total world production decreased slightly compared with that of 1997. Australia, Brazil, Guinea, and Jamaica accounted for about 70% of the total bauxite mined in 1998. The principal sources of nonmetallurgical-grade bauxite are limited to only a handful of countries; abrasive grade is produced in Australia, China, Guinea, and Guyana, and refractory grade, in Brazil, China, and Guyana (Sehnke, 1995, p. 40).

Total reported world reserves of bauxite are sufficient to meet cumulative world primary aluminum metal demand well into the 21st century. Although bauxite reserves are unevenly distributed throughout the world, with approximately 90% in about a dozen countries, the sheer magnitude of these reserves (25 billion metric tons) is sufficient to ensure a readily

accessible supply for the future (Plunkert, 1999).

U.S. production of alumina (calcined equivalent), derived almost exclusively from imported metallurgical-grade bauxite, increased by 10% in 1998 compared with that of 1997. An estimated 91% of the alumina shipped by U.S. refineries went to domestic primary smelters for aluminum metal production. Consumption by the abrasives, chemicals, refractories, and specialties industries accounted for the remainder of the U.S. alumina usage.

World output of alumina increased slightly in 1998. The principal producing countries, in descending order of alumina output, were Australia, the United States, Jamaica, and China. These countries accounted for more than 55% of the world's production; Australia alone accounted for almost one-third of total world production.

Legislation and Government Programs

In October 1998, the Defense Logistics Agency (DLA) released its Annual Materials Plan (AMP) for the National Defense Stockpile (NDS) for fiscal year 1999. The 1999 AMP, including its subsequent revisions, provided for the sale of 3.56 million tons (3.5 million long tons) of metallurgical-grade bauxite, of which 2.03 million tons (2 million long tons) was Jamaica type and 1.52 million tons (1.5 million long tons) was Suriname type. Also, as part of the program, the DLA was authorized to dispose of 29,500 calcined tons (29,000 long calcined tons) of refractory-grade bauxite in fiscal year 1999. These were the maximum amounts recommended for disposal during the fiscal year, and the actual level of sales was to be dependent upon the prevailing market conditions.

During calendar year 1998, the DLA announced the following sales of bauxite from the NDS: 20,300 calcined tons (20,000 long calcined tons) of refractory-grade bauxite for a provisional value of \$2.3 million to National Refractories & Minerals Corp. (Defense Logistics Agency, 1998d); 508,000 tons (500,000 long tons) of metallurgical-grade bauxite, Suriname type, for a provisional value of \$3.1 million to Aluminum Company of America (Alcoa) (Defense Logistics Agency, 1998c) plus annual option quantities of 427,000 tons (421,000 long tons) for fiscal years 1999 and 2000 for a total value of \$8.32 million (Defense Logistics Agency, 1998a); and 1.22 million tons (1.2 million long tons) of metallurgical-grade bauxite, Jamaica type, at a provisional value of \$8.5 million to Reynolds Metals Co. and Kaiser Aluminum & Chemical Corp. plus annual option quantities of 1.22 million tons (1.2 million long tons) for fiscal years 1999 through 2002 and option quantities of 610,000 tons (600,000 long tons) for fiscal years 2003 through 2005 for a total provisional value of approximately \$60 million (Defense Logistics Agency, 1998b). Option quantities are subject to AMP authority for each of the out years.

At yearend, the NDS uncommitted inventory for metallurgical-grade bauxite was 7.99 million tons (7.86 million long tons) of Jamaica type and 2.88 million tons (2.84 million long tons) of Suriname type. The NDS calcined refractory-grade bauxite inventory was 73,600 calcined tons (72,500 long calcined tons).

Production

Bauxite.—For many years, domestic mines have supplied substantially less than 1% of the U.S. requirement for bauxite. Essentially all the domestic bauxite production is used in nonmetallurgical products, such as abrasives, chemicals, proppants, and refractories. Thus, the United States imports almost all the bauxite, especially the metallurgical grade, that it requires.

Alumina.—In February, Alcoa World Alumina LLC restarted the alumina refinery on St. Croix, U.S. Virgin Islands. The 600,000-ton-per-year plant had been idled since 1994 (Aluminum Company of America, 1999, p. 5). In September, the refinery closed temporarily for about a week to repair the damage caused by Hurricane Georges (Metal Bulletin, 1998c).

Consumption

Bauxite.—Total domestic consumption of bauxite increased approximately 10% compared with that of 1997. All the increased consumption was for alumina production. The restart of the St. Croix refinery accounted for the bulk of this increase. In 1998, 94% of the bauxite consumed in the United States was refined to alumina (an estimated 2.1 tons of dried bauxite was required to produce 1 ton of alumina); the remaining 6% was consumed in nonmetallurgical applications (table 4). Domestic production and consumption data for bauxite and alumina were obtained by the U.S. Geological Survey from three separate, voluntary surveys of U.S. operations. Typical of these surveys is "Bauxite Consumption," sent to 55 operations, 42 of which responded, representing 92% of total bauxite consumption listed in table 4.

Global Industrial Technologies Inc., parent of Harbison-Walker Refractories Co., purchased A.P. Green Industries Inc. At the time of the acquisition, A.P. Green operated 22 refractory manufacturing plants in Canada, Colombia, Indonesia, Mexico, the United Kingdom, and the United States. Harbison-Walker's operations comprised 15 plants in Canada, Chile, Germany, Mexico, and the United States (Industrial Minerals, 1998a). Later in the year, Harbison-Walker announced the closing and consolidation of several of these plants. Among them were the A.P. Green facilities in Bessemer, AL, Rockdale, IL, Sulphur Springs, TX, Lehi, UT, and Smithfield, Ontario, Canada, and Harbison-Walker's plants in Calhoun, GA, and Fulton, MO (American Metal Market, 1998).

Alumina.—An estimated 91% of the alumina shipped by U.S. alumina plants went to domestic primary aluminum smelters for metal production. In 1998, 23 primary aluminum smelters consumed 7.19 million tons of alumina. Consumption in various forms by the abrasives, chemicals, refractories, and specialties industries accounted for the remainder of U.S. alumina usage.

Prices

Most metallurgical-grade bauxite and alumina are purchased under long-term contracts. Contract terms for these commodities normally are not made public. Spot prices for metallurgical-grade alumina and specialty forms of bauxite and alumina for nonmetallurgical applications, however, are published in trade journals.

Industrial Minerals (1998c) quoted end-of-year prices for several types of imported refractory-grade bauxite from China and Guyana. The price quotes for Chinese refractory-grade bauxite, minimum 87% Al₂O₃ f.o.b. Chinese ports, were as follows: Shanxi, shaft, lump, \$68 to \$72 per ton, and rotary, lump, \$82 to \$87 per ton, and Guizhou, round, lump, \$65 to \$70 per ton. The price ranges for Guyanese refractory-grade bauxite were as follows: \$155 to \$165 per ton, f.o.b. barge, U.S. Gulf Coast, and \$165 to \$175 per ton, c.i.f. Europe.

The 1998 annual average values of U.S. imports of metallurgical-grade bauxite are listed in table 8.

The market or spot prices for alumina decreased steadily during the year. According to Metal Bulletin, metallurgical-grade alumina spot prices on international markets began 1998 at \$205 to \$225 per ton. The price range decreased steadily during the year and was \$145 to \$160 per ton by December. The price decline for primary aluminum metal and an oversupply of alumina were cited as reasons for this decline (Metal Bulletin, 1998a). Trade data released by the Bureau of the Census indicated the average value of U.S. imports of calcined alumina was \$215 per ton, f.a.s. port of shipment, and \$230 per ton, c.i.f. U.S. ports.

Foreign Trade

In addition to the trade data listed in tables 9-11, various specialty aluminum compounds were also exported and imported by the United States. The compounds exported included 7,370 tons of aluminum sulfate, 16,200 tons of aluminum chloride, 8,910 tons of aluminum oxide abrasives, and 11,900 tons of various fluoride-based compounds of aluminum, including synthetic cryolite and aluminum fluoride. The compounds imported included 31,100 tons of aluminum sulfate, 1,580 tons of aluminum chloride, 180,000 tons of aluminum oxide abrasives, and 22,400 tons of various fluoride-based aluminum compounds.

World Review

In 1998, world production of bauxite decreased slightly compared with that of 1997 (table 12). Mine production was reported in 23 countries, and total world production amounted to almost 122 million tons. The largest producers of bauxite, in decreasing order of tonnage mined, continued to be Australia, Guinea, Jamaica, and Brazil, accounting for about 70% of total world production.

World output of alumina increased by about 3% in 1998 compared with that of 1997 (table 13). The four principal producing countries, in order of quantity of alumina produced, were Australia, the United States, Jamaica, and China. These countries accounted for more than 55% of the world's production; Australia alone accounted for almost one-third.

Australia.—Swiss Aluminium Australia Ltd., a wholly

owned subsidiary of Alusuisse-Lonza Group Ltd., announced plans to increase production at its Gove refinery through the introduction of new technology that will fine tune the alumina refining process. Alumina output at Gove, in the Northern Territory, was expected to increase from the current level of 1.75 million tons per year to about 2 million tons per year in 2001. Nabalco Pty. Limited managed the Gove project, which was a joint venture between Alusuisse (70%) and Gove Aluminium Limited (30%) (Hotter, 1998).

Alcan South Pacific Pty. Ltd, a subsidiary of Alcan Aluminium Limited, and Comalco Limited signed an agreement for the future development of the Alcan-owned Ely Bauxite Reserve with Comalco's Weipa operations on Western Cape York Peninsula, Queensland. Alcan started construction of the Ely project in August 1997 as a stand-alone project. Alcan and Comalco have agreed to develop the Ely Reserve so that it will be integrated with the existing Comalco infrastructure at Weipa, 20 kilometers from Alcan's Ely Mine. This agreement will eliminate the complexity of simultaneously processing two different grades of bauxite at the alumina refinery and will optimize the regional bauxite mining and shipping infrastructure (Alcan Aluminium Limited, 1998a).

Austria.—Kemira Chemie Ges.mbH, a subsidiary of Kemira Chemicals Oy, signed an agreement to acquire the aluminum sulfate business of Krems Chemie AG, owned by Neste Chemicals Oy. The sale included a 30,000-ton-per-year aluminum sulfate plant in Krems, Austria. The aluminum sulfate is used by the pulp and paper industry as a sizing, retention, and effluent-water-treatment chemical (Industrial Minerals, 1998b).

Brazil.—Companhia Vale do Rio Doce (CVRD) announced plans to increase production at the Alumina do Norte do Brasil S.A. (Alunorte) alumina refinery. Alumina output was expected to increase from 1.1 million tons per year to 1.3 million tons per year through either a \$30 million investment or through efficiency gains (Kepp, 1998).

Canada.—As part of its program to divest noncore assets, Alcan announced the sale of Handy Chemicals Ltd., a wholly owned subsidiary in Candiac, Quebec. Rütgers Organics GmbH, a German-based manufacturer of fine and specialty chemicals, will purchase the superplasticizer component, and L'Environnement Eaglebrook Quebec Ltée, a Canadian subsidiary of Eaglebrook, Inc. of Matteson, IL, will purchase the water treatment component (Alcan Aluminium Limited, 1998c).

China.—In 1997, Alcoa and Sino Mining Alumina Limited finalized a long-term agreement for the purchase of alumina for the Chinese aluminum industry. Sino Mining is owned by the China State Nonferrous Metals Industry Administration (SNMIA), a Chinese state-owned enterprise that replaced the China National Nonferrous Metals Industry Corporation, which was dissolved in 1998. The ongoing restructuring of SNMIA and the Chinese aluminum industry has not impacted the agreement that entitles Sino Mining to purchase a minimum of 400,000 tons per year of alumina for 30 years. The agreement includes an option to increase this purchase to 1 million tons per year as the needs of the Chinese aluminum industry grow (Aluminum Company of America, 1999, p. 3).

In October, Alcoa and SNMIA also announced the signing of a memorandum of understanding to study the feasibility of forming a joint venture involving several refining, smelting,

and fabricating facilities in China. The study will be conducted during the next 6 to 12 months (Aluminum Company of America, 1998).

Ghana.—Alcan purchased control of Ghana Bauxite Company Ltd. (GBC). Under the agreement reached with the Government of Ghana, Alcan increased its stake in GBC from 45% to 80%; the Government retained the remaining 20% share. Alcan also announced that it expected to expand and increase GBC's bauxite production to 1 million tons per year (Alcan Aluminium Limited, 1998b).

Guinea.—The Government reported plans to privatize Société d'Economie Mixte Friguia's bauxite and alumina assets, which consisted of the Kimbo bauxite mine and the Friguia alumina refinery. In October, the Government, which already held 49% of Friguia, acquired the 51% stake that had been held by the Frialco Holding Co., consisting of Aluminum Pechiney CRV and Noranda Inc. (30% each), and Alcan and Hydro Aluminium (20% each). The sale, originally scheduled for December, was postponed to February 1999 (Metal Bulletin, 1998b).

Australia's Union Mining NL was awarded a reconnaissance license covering all of the Gaoual bauxite deposits just north of the Boké bauxite mine. The deposits were estimated to contain about 1.8 billion tons of ore grading better than 50% Al_2O_3 or 6.7 billion tons of ore grading better than 40% Al_2O_3 . The company indicated that this prefeasibility study would be used to not only verify the resource, but also to determine the optimum development path (Metal Bulletin, 1998f). Union Mining has since applied for three prospecting permits in the area. If the Government grants the permits, then Union Mining will undertake a full feasibility study for the development of a new bauxite mine and possibly an associated alumina refinery (Metal Bulletin, 1998e).

Hungary.—Bakonyi Bauxitbanya Kft announced that production had begun at its new underground bauxite mine, Fenyöfő II, in western Hungary. The new mine will compensate for lost output from the Fenyöfő I open-pit mine, which was expected to close in 1999. The new mine has a production capacity of 250,000 tons per year and an estimated life expectancy of 10 years (Metal Bulletin, 1998d).

India.—Alcan acquired additional shares of Indian Aluminium Co. Ltd. (Indal) stock and increased its ownership to 54.6% from 34.6%. Indal was a fully integrated aluminum company with mining, refining, smelting, and fabricating facilities throughout the country (Platt's Metals Week, 1998).

Russia.—In October, the Russian Government issued a special order to expedite the development of the Sredny Timan bauxite fields in the Republic of Komi. The new bauxite mines will feed the Siberian-Ural Aluminum Company, which includes the Irkutsk and Uralsky plants, and the Bogoslovsky refinery in Sverdlovsk. The Sredny Timan bauxite fields were estimated to contain 30% of Russia's bauxites, more than 90% of which can be mined from an open pit. Boksit Timana, the company set up to mine these fields, reportedly intends to supply the Uralsky refinery with 500,000 tons of bauxite in 1999. Full production capacity of these new mines was projected to be 4.25 million tons per year. In 1998, the Bogoslovsky and Uralsky plants received their bauxite from the Sevuralboksitruuda mining company in Sverdlovsk, but its reserves were nearing exhaustion (Interfax Mining & Metals Report, 1998).

Saudi Arabia.—In May, the Deputy Ministry for Mineral Resources (DMMR) issued a tender inviting applications for an exploration license centered on the Al-Zabirah bauxite deposit located roughly 550 kilometers north of Riyadh. The tender provided geologic assessment details on the exploration of the deposits by the DMMR (Engineering & Mining Journal, 1998). The bauxite is essentially of the monohydrate type containing Al₂O₃ (57.5%), Fe₂O₃ (8%) and SiO₂ (6%). Conventional surface mining methods could be used at the deposit (Collenette and Grainger, 1994).

Outlook

World bauxite reserves are sufficient to meet cumulative world demand well into the next century. Considering the probability of discovering additional bauxite deposits plus the added possibility of employing lower grade bauxite occurrences and various alternative sources of alumina, world resources of aluminum remain adequate to satisfy demand for the foreseeable future.

Aluminum demand in the United States is expected to remain moderately strong, and the demand in Western Europe, though weaker, is expected to remain positive. Moreover, there have been some indications that the economic crisis in Asia may be easing a bit. Hence, world demand for alumina should remain strong.

World production of aluminum is expected to continue to increase; two greenfield smelter projects under construction in Canada and Mozambique should come on-stream in the next couple of years. These projects and other planned expansions should keep the alumina supply and demand balanced in the short term. In the long term, worldwide demand for aluminum is expected to grow steadily, thereby increasing the demand for bauxite and alumina feedstocks.

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TABLE 1
SALIENT BAUXITE STATISTICS 1/

(Thousand metric tons and thousand dollars)

	1994	1995	1996	1997	1998
United States:					
Production: Crude ore (dry equivalent)	W	W	W	NA	NA
Value	W	W	W	NA	NA
Exports (as shipped):					
Crude and dried	114	86	92	64	83
Calcined	15	22	40	21	16
Imports for consumption (as shipped):					
Crude and dried	10,700	10,100	10,200	10,700	11,000
Calcined	349	482	352	369	393
Consumption (dry equivalent)	11,200	10,900	11,000	11,500	12,700
World: Production	106,000	112,000	118,000 r/	123,000	122,000 e/

e/ Estimated. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to three significant digits.

TABLE 2
PRODUCTION AND SHIPMENTS OF ALUMINA IN THE UNITED STATES 1/

(Thousand metric tons)

Year	Calcined alumina	Other alumina 2/	Total	
			As produced or shipped 3/	Calcined equivalent
Production: e/				
1997	4,510	851	5,360	5,090
1998	5,100	820	5,920	5,590
Shipments: e/				
1997	4,510	851	5,360	5,090
1998	5,080	822	5,910	5,580

e/ Estimated.

1/ Data are rounded to three significant digits.

2/ Trihydrate, activated, tabular, and other aluminas. Excludes calcium and sodium aluminates.

3/ Includes only the end product if one type of alumina was produced and used to make another type of alumina.

TABLE 3
CAPACITIES OF DOMESTIC ALUMINA PLANTS, DECEMBER 31 1/ 2/

(Thousand metric tons per year)

Company and plant	1997	1998
Alcoa Inc.:		
Point Comfort, TX	2,300	2,300
St. Croix, VI	600	600
Total	2,900	2,900
Kaiser Aluminum & Chemical Corp.: Gramercy, LA		
	1,050	1,050
Ormet Corp.: Burnside, LA		
	600	600
Reynolds Metals Co.: Corpus Christi, TX		
	1,600	1,600
Grand total	6,150	6,150

1/ Capacity may vary depending on the bauxite used.

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
U.S. CONSUMPTION OF BAUXITE, BY INDUSTRY 1/

(Thousand metric tons, dry equivalent)

Industry	1997	1998
Abrasive	98	135
Alumina	10,700	12,000
Chemical	W	W
Refractory	466	332
Other 2/	241	291
Total	11,500	12,700

W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes cement, chemical, municipal water works, oil, and steel and ferroalloys.

TABLE 5
PRODUCTION AND SHIPMENTS OF SELECTED ALUMINUM
SALTS IN THE UNITED STATES IN 1997 1/

Item	Number of producing plants	Production (thousand metric tons)	Total shipments, including interplant transfers	
			Quantity (thousand metric tons)	Value (thousands)
Aluminum sulfate:				
Commercial and municipal (17% Al ₂ O ₃)	67	1,050	998	\$111,000
Iron-free (17% Al ₂ O ₃)	12	111	113	13,500
Aluminum chloride:				
Liquid and crystal	5	31	W	W
Anhydrous (100% AlCl ₃)	3	26	26	29,500
Aluminum fluoride, technical	3	W	W	W
Aluminum hydroxide, trihydrate [100% Al(OH) ₃]	12	937	1,010	250,000
Aluminates	17	291	291	43,900
Other aluminum compounds 2/	XX	XX	XX	W

W Withheld to avoid disclosing company proprietary data. XX Not applicable.

1/ Data are rounded to three significant digits.

2/ Includes light aluminum hydroxide, cryolite, etc.

Source: Data are based on Bureau of the Census 1997 Current Industrial Reports, Series MA-28A, "Inorganic Chemicals."

TABLE 6
STOCKS OF BAUXITE IN THE UNITED STATES, DECEMBER 31 1/ 2/

(Thousand metric tons, dry equivalent)

Sector	1997	1998
Producers, processors, and consumers	2,260	1,860
Government	14,300	11,000
Total	16,500	12,800

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Domestic and foreign bauxite; crude, dried, calcined, activated, all grades.

TABLE 7
STOCKS OF ALUMINA IN THE UNITED STATES, DECEMBER 31 1/ 2/

(Thousand metric tons, calcined equivalent)

Sector	1997	1998
Producers	333	335
Primary aluminum plants	1,010	997
Total	1,340	1,330

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes consumers stocks other than those at primary aluminum plants.

TABLE 8
AVERAGE VALUE OF U.S. IMPORTS OF CRUDE AND DRIED BAUXITE 1/

(Per metric ton)

Country	1997		1998	
	Port of shipment (f.a.s.)	Delivered to U.S. ports (c.i.f.)	Port of shipment (f.a.s.)	Delivered to U.S. ports (c.i.f.)
Australia	\$9.45	\$20.47	\$13.27	\$22.51
Brazil	27.85	34.45	26.05	33.49
Guinea	26.35	26.53	25.09	31.87
Guyana	25.07	35.42	31.21	39.08
Jamaica	20.41	25.56	16.74	21.78
Weighted average	24.64	28.54	22.69	29.12

1/ Computed from quantity and value data reported to U.S. Customs Service and compiled by the Bureau of the Census, U.S. Department of Commerce. Not adjusted for moisture content of bauxite or differences in methods used by importers to determine value of individual shipments.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF BAUXITE, CRUDE AND DRIED,
BY COUNTRY 1/

(Thousand metric tons)

Country	1997	1998
Imports: 2/		
Australia	54	158
Brazil	2,030	1,730
Guinea	4,150	3,880
Guyana	639	977
Jamaica 3/	3,640	4,020
Other	177	235
Total	10,700	11,000
Exports:		
Canada	53	60
Mexico	(4/)	2
Other	11	21
Total	64	83

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes bauxite imported to the U.S. Virgin Islands from foreign countries.

3/ Dry equivalent of shipments to the United States.

4/ Less than 1/2 unit.

NOTE: Total U.S. imports of crude and dried bauxite (including the U.S. Virgin Islands) as reported by the Bureau of the Census were as follows: 1997--10,200,000 tons and 1998--10,800,000 tons.

Sources: Bureau of the Census and the Jamaica Bauxite Institute.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF CALCINED BAUXITE, BY COUNTRY 1/

(Thousand metric tons and thousand dollars)

Country	1997				1998			
	Refractory grade		Other grade		Refractory grade		Other grade	
	Quantity	Value 2/	Quantity	Value 2/	Quantity	Value 2/	Quantity	Value 2/
Imports:								
Australia	--	--	23	2,290	--	--	15	1,590
Brazil	17	2,930	17	1,670	72	7,600	2	118
China	84	6,680	125	9,950	92	6,530	99	7,090
Guyana	62	7,930	--	--	32	3,570	59	1,620
Other	17	1,750	25	780	22	1,170	--	--
Total	180	19,300	190	14,700	218	18,900	175	10,400
Exports:								
Canada	(3/)	95	6	501	1	206	10	892
Japan	8	2,070	--	--	(3/)	21	--	--
Mexico	4	644	1	303	3	726	(3/)	101
Other	1	185	1	542	(3/)	101	1	379
Total	12	3,000	9	1,350	5	1,050	11	1,370

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Value at foreign port of shipment as reported to U.S. Customs Service.

3/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF ALUMINA, BY COUNTRY 1/

(Thousand metric tons, calcined equivalent, and thousand dollars)

Country	1997		1998	
	Quantity	Value 2/	Quantity	Value 2/
Imports:				
Australia	2,920	601,000	2,640	508,000
Brazil	79	24,600	81	16,600
Canada	93	60,200	93	58,800
France	8	13,100	12	18,700
Germany	50	84,500	50	71,800
India	41	17,800	235	44,100
Jamaica	207	40,900	374	76,200
Japan	6	13,500	15	12,500
Suriname	225	71,600	463	86,600
Trinidad and Tobago	91	26,400	--	--
Venezuela	39	27,000	28	12,700
Other	66	31,200	54	26,900
Total	3,830	1,010,000	4,050	933,000
Exports:				
Brazil	1	5,180	1	2,530
Canada	810	212,000	757	230,000
China	68	21,400	28	5,820
Finland	31	6,430	(3/)	232
Mexico	156	61,700	159	47,700
Netherlands	28	15,600	9	7,840
Norway	(3/)	71	(3/)	163
Russia	97	21,200	179	34,200
Sweden	(3/)	596	(3/)	895
Other	79	179,000	150	159,000
Total	1,270	523,000	1,280	488,000

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Value at foreign port of shipment as reported to U.S. Customs Service.

3/ Less than 1/2 unit.

Source: Bureau of the Census.

TABLE 12
BAUXITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Thousand metric tons)

Country	1994	1995	1996	1997	1998 e/
Albania e/	2	1	1	1	--
Australia	41,733	42,655	43,063	44,465 r/	44,553 3/
Bosnia and Herzegovina e/	75	75	75	75	75
Brazil	8,673	10,214	10,998 r/	11,671 r/	11,700
China e/	3,700	5,000	6,200	8,000	8,200
Croatia e/	1	2 3/	--	--	--
Ghana	452	697	631	537 r/	650
Greece	2,196	2,200	2,452	1,877 r/	2,000
Guinea e/ 4/	13,300	15,800	16,500	17,100 r/ e/	15,000
Guyana 4/	1,732	2,028	2,485	2,502	2,600 3/
Hungary	836	1,015	1,044	743	750
India	4,809	5,240	5,757	5,800 e/	5,700
Indonesia	1,342	899	842 r/	809 r/	1,056 3/
Iran	68	148	150 e/	150 e/	150
Italy e/	23	11	--	--	--
Jamaica 4/ 5/	11,564	10,857	11,863	11,987 r/	12,646 p/
Kazakhstan	2,425	3,071	3,140 e/	3,380 r/ e/	3,400
Malaysia	162	184	219	279	160 3/
Mozambique	10	11 e/	11 r/	8 r/	6 3/
Pakistan	5	3	4	5 r/	5 3/
Romania	184	174	175	127	130
Russia e/	3,000	3,100	3,300	3,350	3,450
Serbia and Montenegro	--	60	323	470	110
Sierra Leone	735	--	--	--	--
Suriname	3,772	3,530	3,695 r/	3,877 r/	4,000
Turkey 6/	445	232	545	369 r/	458 3/
United States	W	W	W	NA	NA
Venezuela	4,419	5,022	4,807	5,084	5,100 p/
Total	106,000	112,000	118,000 r/	123,000	122,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "Total."

1/ World totals and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Table includes data available through July 23, 1999.

3/ Reported figure.

4/ Dry bauxite equivalent of crude ore.

5/ Bauxite processed for conversion to alumina in Jamaica plus kiln-dried ore prepared for export.

6/ Public-sector production only.

TABLE 13
ALUMINA: WORLD PRODUCTION, BY COUNTRY 1/ 2/ 3/

(Thousand metric tons)

Country	1994	1995	1996	1997	1998 e/
Australia	12,892	13,147	13,348	13,385	13,853 4/
Azerbaijan e/	100	27 4/	5	10	10
Bosnia and Herzegovina e/	50	50	50	50	50
Brazil	1,868	2,141	2,752 r/	2,800 r/	2,800 4/
Canada	1,170	1,064	1,060	1,165 e/	1,170
China e/	1,850	2,200	2,550	2,940 r/	3,330
France	344	425	440 r/	454 r/	450
Germany	824	750 r/	755 r/	750 e/	750
Greece	548	598	602	602 e/	600
Guinea	640	616	640 e/	520 r/ e/	500
Hungary	177	184	208	76	75
India	1,456	1,650	1,700 e/	1,700 e/	1,600
Ireland	1,140	1,186	1,234	1,273 r/	1,200
Italy	557	857	881	850 e/	850
Jamaica	3,221	3,030	3,200	3,394 r/	3,440 4/
Japan 5/	326	363	337	340 e/	330
Kazakhstan	900 e/	1,022	1,083	1,095 r/	1,085 4/
Romania	302	323	261	282	300
Russia	2,254	2,300 e/	2,105	2,400 r/	2,465 4/
Serbia and Montenegro	--	35	186	160 r/ e/	70
Slovakia e/	75	100	100 e/	100	100
Slovenia	3	14	88 r/	85 r/	100
Spain 6/	1,071	1,070	1,095	1,110	1,100
Suriname	1,497	1,589	1,600 e/	1,600	1,600
Turkey	155	172	159	164 r/	157 4/
Ukraine e/	1,070	1,100	1,000	1,075 r/	1,291 4/
United Kingdom e/	105	108	99 4/	100	100
United States	4,860	4,530	4,700	5,090	5,590 4/
Venezuela	1,300 e/	1,641	1,778	1,800 e/	1,800
Total	40,800	42,300 r/	44,000 r/	45,400 r/	46,800

e/ Estimated. r/ Revised.

1/ Figures represent calcined alumina or the total of calcined alumina plus the calcined equivalent of hydrate when available; exceptions, if known, are noted.

2/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

3/ Table includes data available through July 24, 1999.

4/ Reported figure.

5/ Data presented are for alumina used principally for specialty applications. Gross weight of aluminum hydrate for all uses was as follows, in thousand metric tons: 1993--704; and 1994-98--not available.

6/ Hydrate.