

BAUXITE AND ALUMINA

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Bauxite is a naturally occurring, heterogeneous material composed 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 diasporite [both $\text{AlO}(\text{OH})$].

Bauxites are typically classified according to their intended commercial applications—abrasive, cement, chemical, metallurgical, refractory, etc. 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).

The nonmetallurgical or specialty applications of bauxite compose 5% of total worldwide crude ore production. Specifications for these premier 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. Figures on bauxite production and consumption within non-metallurgical markets are not commonly available. It is currently accepted, however, that the principal industrial end uses for nonmetallurgical-grade bauxite are in refractories and abrasives, followed by cement applications. In addition, the aluminum chemicals and steel industries also consume significant quantities of bauxite.

In 1997, 24 countries reported bauxite mine production, and total world production increased slightly compared with that of 1996. Australia, Brazil, Guinea, and Jamaica accounted for about 70% of the total bauxite mined in 1997. The principal sources of nonmetallurgical-grade bauxite are very limited and comprise only a handful of countries; abrasive grade is produced in Australia, China, Guinea, and Guyana, and refractory grade in Brazil, China, and Guyana.

Total known 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% occurring in about

a dozen countries, the sheer magnitude of the reserves (23 billion metric tons) is sufficient to ensure a readily accessible supply for the future.

U.S. production of alumina (calcined equivalent), derived almost exclusively from imported metallurgical-grade bauxite, increased by 8% in 1997 compared with that of 1996 as additional capacity installed at some refineries in 1996 became fully operational. An estimated 89% 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 1997. The principal producing countries, in descending order of quantity of alumina produced, were Australia, the United States, Jamaica, and China. These countries accounted for more than one-half of the world's production.

Legislation and Government Programs

In October 1997, the Defense Logistics Agency (DLA) released its Annual Materials Plan (AMP) for the National Defense Stockpile (NDS) for fiscal year 1998. The 1998 AMP, including its subsequent revisions, provided for the sale of 2.03 million tons (2 million long tons) of metallurgical-grade bauxite, of which 1.22 million tons (1.2 million long tons) was Jamaica type and 813,000 tons (800,000 long tons) was Suriname type. Additionally, as part of the program, the DLA was authorized to dispose of 81,300 calcined tons (80,000 long calcined tons) of refractory-grade bauxite in fiscal year 1998. 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 1997, the DLA announced the following sales of bauxite from the NDS: a total of 62,000 calcined tons (61,000 long calcined tons) of refractory-grade bauxite for an approximate market value of \$5.1 million to Harbison-Walker Refractories Co., National Refractories & Minerals Corp., and A.P. Green Industries, Inc. (Defense Logistics Agency, 1997c); 244,000 tons (240,000 long tons) of metallurgical-grade bauxite, Suriname type, for an approximate value of \$2.8 million to Aluminum Company of America (Alcoa) (Defense Logistics Agency, 1997b); and a total of 610,000 tons (600,000 long tons) of metallurgical-grade bauxite, Jamaica type, at a provisional value of \$5.2 million to Kaiser Aluminum & Chemical Corp. and Reynolds Metals Co. (Defense Logistics Agency, 1997a).

At yearend, the NDS uncommitted inventory for metallurgical-grade bauxite was 9.89 million tons (9.73 million long tons) of Jamaica type and 4.25 million tons (4.19 million long tons) of Suriname type. The NDS calcined refractory-grade bauxite

inventory was 91,600 tons (90,200 long 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.

Because the number of domestic mines is small and there is only one domestic producer of bauxite, C-E Minerals Inc., U.S. bauxite production figures can not be published, as they would reveal company proprietary information. As this situation is unlikely to change, the U.S. Geological Survey (USGS) has discontinued the collection of bauxite production data.

Alumina.—Alcoa announced the restart of alumina production at its St. Croix, U.S. Virgin Islands, refinery. The 600,000-ton-per-year refinery was expected to be operational in early 1998. Alcoa purchased the St. Croix refinery from the Virgin Islands Alumina Corp. (Vialco), a subsidiary of Glencore International AG, in July 1995. The plant has been idle since 1994 (Aluminum Company of America, 1997b).

On September 25, Ormet Corp. and the United Steelworkers of America signed a new 3-year labor contract covering approximately 250 employees at the 600,000-ton-per-year Burnside, LA, alumina refinery (Platt's Metals Week, 1997b).

Consumption

Total domestic consumption of bauxite increased slightly compared with that of 1996. Most of the increased consumption was for alumina production as increased capacity at some domestic refineries became fully operational in 1997. Approximately 93% of the bauxite consumed in the United States in 1997 was refined to alumina, and an estimated 2.1 tons of dried bauxite was required to produce 1 ton of alumina. Domestic production and consumption data for bauxite and alumina were obtained by the USGS from three separate, voluntary surveys of U.S. operations. Typical of these surveys is "Bauxite Consumption," sent to 59 operations, 49 of which responded, representing 91% of the total bauxite consumed shown in table 4.

An estimated 89% of the alumina shipped by U.S. alumina plants went to domestic primary smelters for aluminum metal production. In 1997, 22 primary aluminum smelters consumed 6.89 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.

Cytec Industries Inc. announced the sale of seven alum (aluminum sulfate) manufacturing plants in the Southeastern United States, as well as a kaolin calcining plant in Andersonville, GA, with its associated mineral reserves, to GEO Specialty Chemicals Inc. The kaolin assets purchased by GEO include 30 million tons of kaolin, bauxitic clay, and bauxite reserves in Andersonville and a 145,000-ton-per-year calcining plant that supplied all the calcined kaolin required for the alum business. These mineral reserves are suitable for producing

calcined kaolin for alum, high and low alumina refractories, and paint fillers (Industrial Minerals, 1997b).

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 quoted prices at the end of the year for several types of imported refractory-grade bauxite from China and Guyana. The price quotes for Chinese refractory-grade bauxite, minimum 87% Al_2O_3 , f.o.b. Chinese ports, were as follows: Shanxi, shaft, lump, \$66 to \$70 per ton, and rotary, lump, \$82 to \$92 per ton, and Guizhou, round, lump, \$70 to \$75 per ton. The price ranges for Guyanese refractory-grade bauxite were \$155 to \$165 per ton, f.o.b. barge, U.S. Gulf Coast, and \$165 to \$175 per ton, c.i.f. Europe (Industrial Minerals, 1997c). (See table 8.)

The market or spot prices for alumina fluctuated during the year but closed the year at a higher price range than that at the end of 1996. According to Metal Bulletin, metallurgical-grade alumina spot prices on international markets began 1997 at \$150 to \$160 per ton. The price range gradually increased, reaching a high for the year of \$225 to \$245 per ton in early April. The price then decreased to \$195 to \$205 per ton in late June before gradually climbing back to \$210 to \$230 per ton at the beginning of October. The price remained in this range until late December when the price decreased slightly to \$205 to \$225 per ton. The alumina spot price finished the year in this range. Trade data released by the U.S. Bureau of the Census indicated the average value of U.S. imports of calcined alumina was \$246 per ton, f.a.s. port of shipment, and \$260 per ton, c.i.f. U.S. ports.

Foreign Trade

In addition to the trade data shown in tables 9, 10, and 11, various specialty aluminum compounds were also exported from and imported into the United States. The compounds exported included 4,380 tons of aluminum sulfate, 12,400 tons of aluminum chloride, 10,700 tons of aluminum oxide abrasives, and 11,400 tons of various fluoride-based compounds of aluminum, including synthetic cryolite and aluminum fluoride. The compounds imported included 34,400 tons of aluminum sulfate, 565 tons of aluminum chloride, 138,000 tons of aluminum oxide abrasives, and 12,800 tons of various fluoride-based aluminum compounds.

World Review

In 1997, world production of bauxite and alumina increased slightly in response to a slight increase in metal production. Mine production was reported in 24 countries, and total world production amounted to about 123 million tons, 2% higher than that of 1996. Australia, Guinea, Brazil, and Jamaica, in decreasing order of tonnage mined, continued to be the largest producers of bauxite and accounted for about 70% of total world

production. (See table 12.)

World output of alumina increased about 3% in 1997 compared with that of 1996. 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 one-half of the world's production. (See table 13.)

Australia.—Alcoa World Alumina and Chemicals (AWAC) announced that construction had begun on a 440,000-ton-per-year expansion at its Wagerup alumina refinery in Western Australia. The \$193 million expansion, which was expected to be completed by mid-1999, will increase Wagerup's operating capacity from 1.75 million tons per year to 2.19 million tons per year. This expansion is the first stage of a planned expansion to 3.3 million tons per year. AWAC is a global alliance between Alcoa (60%) and WMC Ltd. (40%) (Aluminum Company of America, 1997a).

Worsley Alumina Pty. Ltd. announced a \$600 million expansion program that will increase annual capacity at the Worsley alumina refinery to 3.1 million tons. Construction began in October and was scheduled for completion by mid-2000. A related project initiated in 1996 will increase the plant's capacity from 1.73 million tons per year to 1.88 million tons per year by mid-1998. Worsley is a joint venture company whose members are Reynolds Australia Alumina Ltd. (56%), Billiton Australia Pty. Limited (30%), Kobe Alumina Associates (Australia) Pty. Ltd. (10%), and Nissho Iwai Alumina Pty. Limited (4%) (Reynolds Metals Co., 1997).

Alcan Aluminium Ltd. announced a \$130 million investment in a new bauxite mine at Ely in North Queensland. The mine will be owned and operated by Alcan subsidiary Alcan South Pacific Pty. Ltd. and will have an initial output of 2.5 million tons per year. Construction began in September, and the first bauxite is expected to be shipped in the fourth quarter of 1999 (Alcan Aluminium Ltd., 1997).

Brazil.—Companhia Vale do Rio Doce (CVRD) was privatized at an auction held at the Rio de Janeiro Stock Exchange on May 6. Valepar S.A., formed by a group of national and international investors, assumed control of the company with the purchase of 41.73% of the voting capital. Brazil's largest steelmaker, Companhia Siderurgica Nacional, is the largest shareholder in Valepar with 16.3% of CVRD's voting shares. Other members include the U.S. Nations Bank and Brazilian investment and pension funds. Following the sale, CVRD was restructured into three business units—Ore, Aluminum, and Pulp and Paper—along with the Corporate Center. CVRD's aluminum activities are conducted by Aluvale, a wholly owned subsidiary that manages the company's interest in bauxite mines, the Alunorte refinery, and the Albras and Valesul smelters (Companhia Vale do Rio Doce, 1997 annual report, accessed August 5, 1998, at URL <http://www.cvrd.com.br/cvrd/cvrd-ing/ra98i/index.htm>).

Greece.—Bauxite Parnasse Mining Co. SA, the largest bauxite mining enterprise in Greece, merged with Silver and Baryte Ores Mining Co. SA to form Silver and Barytes Mining Co. Parnasse bauxite is mined at the mountains of Parnassos and Ghiona and transported to Itea for crushing, screening, and loading. The company reported that production in 1996 reached 1.2 million tons (Spoudeas, 1997).

Hungary.—Hungalu Rt, the state aluminum holding company, announced the sale of a 90% interest in the 300,000-ton-per-year Ajka alumina refinery to Inotai Aluminium Kft. The remaining 10% interest will be offered to Ajka's employees. As part of the sales agreement, Inotai reportedly agreed to maintain alumina production for 10 years, to invest \$21.9 million in plant improvements, and to continue to employ the current workforce (Metal Bulletin, 1997b).

The 720,000-ton-per-year Almásfüzitő alumina refinery was closed only weeks after its purchase by HungAlumina Kft, a consortium of Austrian, Hungarian, and Russian investors. HungAlumina subsequently declared bankruptcy. This leaves the Ajka refinery as the sole alumina refinery in Hungary still in operation (Metal Bulletin, 1997c).

India.—Several companies have announced plans to develop new alumina production capacity. Gujarat Mineral Development Corp., Gujarat Alkalies and Chemicals Ltd., and Raytheon Corp. are evaluating a \$600 million greenfield project that would have an installed annual capacity to produce 750,000 tons of alumina, 30,000 tons of fused alumina, and 1 million tons of metallurgical coke (Platt's Metals Week, 1997c). Hindalco Industries Ltd. announced the signing of a memorandum of understanding with state-owned Orissa Mining Corp. to develop a \$2.8 billion integrated alumina-aluminum complex that includes a 1-million-ton-per-year alumina refinery, a 250,000-ton-per-year aluminum smelter, and a 600-megawatt captive powerplant with associated bauxite mining facilities (Platt's Metals Week, 1997a). Norsk Hydro, Tata Industries, and Indian Aluminium Co. Ltd. are evaluating a \$1 billion aluminum complex capable of producing 200,000 tons per year of metal and 1 million tons per year of alumina (Rao, 1997).

Italy.—Comalco Ltd. and Glencore AG reached an agreement with Alumix S.p.A., the state-owned aluminum holding company, to purchase its 52.1% stake in Sardinia's Eurallumina alumina refinery. The sale will increase Comalco's and Glencore's shares in the 915,000-ton-per-year plant to 56.2% and 43.8%, respectively (Metal Bulletin, 1998).

Scotland.—Alcan Chemicals Europe announced plans to expand the production of alumina trihydrate (ATH) powders at its plant in Burntisland. The expansion program, to be conducted over the next 2 to 3 years, will double the ATH capacity at the 120,000-ton-per-year plant. ATH powders are used as flame retardant additives in plastics and rubber products (Industrial Minerals, 1997a).

South Africa.—Gencor Ltd. of South Africa announced that it will restructure its assets into two separate companies by transferring its base metal and coal assets to a new company to be called Billiton Plc. and retaining its precious metals assets in Gencor Ltd. Billiton will be listed on the London stock exchange and will have an international portfolio held in six main divisions—aluminum, steel and ferroalloys, coal, titanium, base metals, and nickel (Mining Journal, 1997).

Spain.—After approval by the European Commission and the Spanish Government, Alcoa completed the purchase of Inespal S.A., the state-owned aluminum producer. The purchase includes the 1.1-million-ton-per-year alumina refinery at San Ciprian, three primary aluminum smelters, three rolling mills, two

extrusion plants, and an administrative center in Madrid (Aluminum Company of America, 1998).

Ukraine.—The 1-million-ton-per-year Nikolayev refinery contracted to supply 300,000 tons of alumina between August and December 1997 to the Bratsk, the Krasnoyarsk, the Novokuznetsk, and the Volgograd aluminum smelters in Russia. Further negotiations covering potential contracts for 1998 were expected (Metal Bulletin, 1997a).

Vietnam.—Daewoo Corp. of the Republic of Korea signed a letter of intent with the state-owned Vietnam Minerals Corp. (Vimico) to survey two bauxite deposits in Dac Lac province, 200 kilometers north of Ho Chi Minh City (Platt's Metals Week, 1997d). Subject to a favorable feasibility study undertaken by Daewoo and Korea Resources Corp., Daewoo expected to establish a joint venture with Vimico to build the mine and a 1-million-ton-per-year alumina refinery by 2000 at a cost of some \$1 billion (Mining Magazine, 1997).

Outlook

Presently identified world bauxite reserves are sufficient to meet cumulative world demand well into the next century. Considering the high 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.

Despite the economic crisis in Asia, U.S. aluminum demand has remained relatively stable, and demand in Western Europe has been described as stable. Hence, the demand for alumina should remain strong. Temporary aluminum smelter shutdowns in the first half of 1997 caused by power shortages and production problems have been offset by the restart of idled capacity in the United States and Western Europe. These restarts and the increased alumina purchases by China should keep the alumina supply and demand balanced over 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)

	1993	1994	1995	1996	1997
United States:					
Production: Crude ore (dry equivalent)	W	W	W	W	NA
Value	W	W	W	W	NA
Exports (as shipped)					
Crude and dried	85	114	86	92	64
Calcined	5	15	22	40	21
Imports for consumption (as shipped)					
Crude and dried	11,600	10,700	10,100	10,200	10,700
Calcined	238	349	482	352	369
Consumption (dry equivalent)	12,200	11,200	10,900	11,000 r/	11,500
World: Production	110,000 r/	106,000 r/	112,000 r/	120,000 r/	123,000 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/				
1996	4,150	807	4,960	4,700
1997	4,510	851	5,360	5,090
Shipments: e/				
1996	4,140	806	4,950	4,700
1997	4,510	851	5,360	5,090

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	1996	1997
Aluminum Co. of America:		
Point Comfort, TX	2,300	2,300
St. Croix, VI 3/	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.

3/ Purchased from Virgin Islands Alumina Co. in 1995.

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

(Thousand metric tons, dry equivalent)

Industry	1996	1997
Alumina	10,300	10,700
Abrasive	117 r/	98
Chemical	W	W
Refractory	380 r/	466
Other 2/	252 r/	241
Total	11,000 r/	11,500

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Other."

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 1996 1/

Item	Number of producing plants e/	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)	66	1,090	1,040	\$118,000
Iron-free (17% Al ₂ O ₃)	17	121	121	15,600
Aluminum chloride:				
Liquid and crystal	7	29	W	W
Anhydrous (100% AlCl ₃)	3	29	29	30,700
Aluminum fluoride, technical	3	W	W	W
Aluminum hydroxide, trihydrate [100% Al(OH) ₃]	11	917	957	255,000
Aluminates	15	255	254	43,700
Other aluminum compounds 2/	XX	XX	XX	W

e/ Estimated. 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 1996 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	1996	1997
Producers, processors, and consumers	1,930 r/	2,260
Government	15,700	14,300
Total	17,600 r/	16,500

r/ Revised.

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	1996	1997
Producers	326	333
Primary aluminum plants	1,040 r/	1,010
Total	1,360 r/	1,340

r/ Revised.

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	1996		1997	
	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	\$19.64	\$31.54	\$9.45	\$20.47
Brazil	29.83	39.28	27.85	34.45
Guinea	26.57	33.60	26.35	26.53
Guyana	25.19	37.09	25.07	35.42
Jamaica	25.83	31.34	20.41	25.56
Weighted average	26.89	34.24	24.64	28.54

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	1996	1997
Imports: 2/		
Australia	84	54
Brazil	2,080	2,030
Guinea	3,420	4,150
Guyana	693	639
Jamaica 3/	3,920	3,640
Other	36	177
Total	10,200	10,700
Exports:		
Canada	70	53
Mexico	1	(4)
Other	22	11
Total	92	64

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: 1996--9,930,000 tons and 1997--10,200,000 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	1996				1997			
	Refractory grade		Other grade		Refractory grade		Other grade	
	Quantity	Value 2/	Quantity	Value 2/	Quantity	Value 2/	Quantity	Value 2/
Imports:								
Australia	--	--	(3/)	28	--	--	23	2,290
Brazil	6	654	6	553	17	2,930	17	1,670
China	119	7,410	118	8,890	84	6,680	125	9,950
Guyana	59	8,110	26	633	62	7,930	--	--
Other	17	1,730	1	72	17	1,750	25	780
Total	201	17,900	151	10,200	180	19,300	190	14,700
Exports:								
Canada	(3/)	84	8	657	(3/)	95	6	501
Japan	22	5,240	--	--	8	2,070	--	--
Mexico	3	371	1	188	4	644	1	303
Other	3	871	1	413	1	185	1	542
Total	29	6,570	11	1,260	12	3,000	9	1,350

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	1996		1997	
	Quantity	Value 2/	Quantity	Value 2/
Imports:				
Australia	3,120	590,000	2,920	601,000
Brazil	6	5,410	79	24,600
Canada	102	63,800	93	60,200
France	11	14,800	8	13,100
Germany	42	76,100	50	84,500
India	68	27,100	41	17,800
Jamaica	351	68,100	207	40,900
Japan	7	15,400	6	13,500
Suriname	379	76,500	225	71,600
Trinidad	147	27,900	91	26,400
Venezuela	35	21,900	39	27,000
Other	58	34,600	66	31,200
Total	4,330	1,020,000	3,830	1,010,000
Exports:				
Brazil	2	3,370	1	5,180
Canada	712	187,000	810	212,000
China	(3/)	583	68	21,400
Finland	(3/)	439	31	6,430
Mexico	44	36,900	156	61,700
Netherlands	21	19,000	28	15,600
Norway	(3/)	162	(3/)	71
Russia	75	15,100	97	21,200
Sweden	(3/)	486	(3/)	596
Other	64	110,000 r/	79	179,000
Total	918	374,000	1,270	523,000

r/ Revised.

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	1993	1994	1995	1996	1997 e/
Albania e/	2	2	1	1	1
Australia	41,320	41,733	42,655	43,063 r/	44,065 3/
Bosnia and Herzegovina e/	100	75	75	75	75
Brazil	10,001 r/	8,673	10,214 r/	12,307 r/	12,300
China e/	3,500	3,700	5,000	6,200	8,000
Croatia	2	1 e/	2 r/	-- e/	--
Ghana	365 r/	452 r/	697 r/	631 r/	519
Greece	2,205	2,196	2,200 r/	2,452 r/	2,211 3/
Guinea e/ 4/	15,300 r/	13,300 r/	15,800 r/	16,500 r/	16,500
Guyana 4/	2,125 r/	1,732 r/	2,028 r/	2,485 r/	2,502 3/
Hungary	1,561	836 r/	1,015 r/	1,044	743 3/
India	5,277	4,809	5,240 r/	5,757 r/	5,800
Indonesia	1,320	1,342	899	1,000 e/	1,100
Iran	100 e/	68 r/	148 r/	150 r/ e/	150
Italy e/	90	23	11	--	--
Jamaica 4/ 5/	11,307 r/	11,564	10,857	11,863 r/	11,875 3/
Kazakstan	3,000 e/	2,425	3,071	3,140 e/	3,100
Malaysia	69 r/	162	184	219	279 3/
Mozambique e/	6	10 3/	11	12 r/	8
Pakistan	5	5	3	4	5
Romania	186	184	174	175 r/	127 3/
Russia e/	4,260 3/	3,000	3,100	3,300	3,350
Serbia and Montenegro	102	--	60	323 r/	470 3/
Sierra Leone	1,165	735	--	--	--
Suriname	3,421 r/	3,772	3,530	4,000	4,000
Turkey 6/	538	445	232	545 r/	500
United States	W	W	W	W	NA
Venezuela	2,530 r/	4,419	5,022 r/	4,807 r/	5,084 3/
Total	110,000 r/	106,000 r/	112,000 r/	120,000 r/	123,000

e/ Estimated. 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 June 25, 1998.

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	1993	1994	1995	1996	1997 e/
Australia	12,598	12,892	13,147	13,348 r/	13,385 4/
Azerbaijan e/	200	100	27 4/	5	10
Bosnia and Herzegovina e/	50	50	50	50	50
Brazil	1,853	1,868	2,141 r/	2,725 r/	2,750
Canada	1,182 r/	1,170	1,064	1,060 r/	1,165
China e/	1,820	1,850	2,200	2,550 r/	3,000
France	367 r/	344 r/	425 r/	352 r/	350
Germany	840	824	825 e/	750 r/	750
Greece	615	548 r/	598	602 r/	602
Guinea	656	640	616 r/	640 r/ e/	640
Hungary	421	177	184	208	76 4/
India	1,490	1,456	1,650	1,700 e/	1,700
Ireland	1,103	1,140 r/	1,186	1,234	1,200
Italy	549 r/	557 r/	857	881 r/	850
Jamaica	2,989	3,221	3,030	3,200	3,411 4/
Japan 5/	327	326 r/	363 r/	337 r/	340
Kazakstan e/	1,000	900	1,022 4/	1,083 4/	1,050
Romania	293	302	323	261 r/	282 4/
Russia	2,500 e/	2,254	2,300 e/	2,105	2,300
Serbia and Montenegro	12	--	35 r/	186 r/	200
Slovakia e/	140	75	100	100 e/	100
Slovenia	2 r/	3 r/	14 r/	15 r/	15
Spain 6/	1,060 e/	1,071	1,070 r/	1,095 r/	1,110 4/
Suriname	1,507	1,497	1,589	1,600 e/	1,600
Turkey	169	155	172 r/	159 r/	159
Ukraine e/	1,010	1,070	1,100	1,000	1,000
United Kingdom e/	105	105	108	99 r/ 4/	100
United States	5,290	4,860	4,533	4,700	5,090 4/
Venezuela	1,500	1,300 e/	1,641	1,778 r/	1,800
Total	41,700 r/	40,800 r/	42,400 r/	43,800 r/	45,100

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, 1998.

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: 1992--714; 1993--704; and 1994-97--not available.

6/ Hydrate.