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 aluminosilicates (clay, etc.), iron oxide (Fe_2O_3), silica (SiO_2), titania (TiO_2), and other impurities in trace amounts. The principal aluminum hydroxide minerals found in varying proportions within bauxite are gibbsite [$Al(OH)_3$] and the polymorphs boehmite and diaspore [both AlO(OH)].

Bauxite is typically classified according to its intended commercial application, 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, and an additional 10% is converted to various forms of specialty aluminas for nonmetal uses. The remaining 5% is used directly for nonmetallurgical bauxite applications. The bulk of world bauxite production is used, therefore, as feed for the manufacture of alumina via a wet chemical caustic leach process known as the Bayer process. Most 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 alumina 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 ores are not chemically removed by refining because the ores are used as direct feed for the production of their ultimate end products. Although global figures on nonmetallurgical bauxite production and consumption are not commonly available, the principal industrial end uses 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.

Twenty-two countries reported bauxite mine production in 2003, and total world production increased by 2% compared with that of 2002 (table 11). Australia, Brazil, Guinea, and Jamaica accounted for about two-thirds of the total bauxite mined in 2003. The principal sources of non-metallurgical-grade bauxite were limited to only a handful of countries—abrasive grade was produced in Australia, China, Greece, Guinea, Guyana, and Italy, and refractory grade, in Brazil, China, and Guyana (Russell, 1999, p. 49, 58).

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 (23 billion metric tons) is sufficient to ensure a readily accessible supply for the future (Plunkert, 2004).

U.S. production of alumina (calcined equivalent), derived almost exclusively from imported metallurgical-grade bauxite, increased by 11% compared with that of 2002 (table 2). 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 U.S. alumina shipments.

World output of alumina increased by 3% in 2003 compared with that of 2002. The principal producing countries, in descending order of alumina output, were Australia, China, the United States, Brazil, and Jamaica. These countries accounted for 64% of the world's production; Australia alone accounted for about 30% of total world production (table 12).

Legislation and Government Programs

In October, the Defense Logistics Agency (DLA) released its Annual Materials Plan (AMP) for the National Defense Stockpile (NDS) for fiscal year 2004 (October 1, 2003, to September 30, 2004). The 2004 AMP provided for the sale of 43,700 calcined metric tons (43,000 calcined long tons) of refractory-grade bauxite in fiscal year 2004 (Defense Logistics Agency, 2003). This was the maximum amount recommended for disposal during the fiscal year, and the actual level of sales would depend upon prevailing market conditions and available inventory.

At yearend 2003, the uncommitted inventory for Jamaica type, metallurgical-grade bauxite was depleted, and the NDS calcined refractory-grade bauxite inventory was 42,400 calcined metric tons (41,800 calcined long tons) (Defense Logistics Agency, 2004).

Production

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

Alumina.—In December, Ormet Corp. restarted the 600,000-metric-ton-per-year (t/yr) Burnside, LA, refinery that had been closed since February 2001. The restart was prompted by a dramatic rise in alumina prices during the year (Ormet Corp., 2003).

The alumina production rate at Alcoa Inc.'s Point Comfort, TX, refinery returned to full capacity of 2.3 million metric tons per year (Mt/yr) at the end of the second quarter. The refinery had been operating at a reduced rate of 1.8 Mt/yr since February 2001 (Alcoa Inc., 2003d).

Sherwin Alumina Company (a division of BPU Reynolds Inc.) signed a $96 million, 3-year contract to provide 160,000 t/yr of smelter-grade alumina to China. This was the company's first agreement to ship product from its 1.6-Mt/yr Corpus Christi, TX, refinery to China (Zielenbach, 2003§[1]).

Kaiser Aluminum & Chemical Corp., which filed for bankruptcy protection at the beginning of 2002, filed a motion in a U.S. bankruptcy court requesting that November 7 be set as a deadline for bids for the following four of its assets: the 1.25-Mt/yr Gramercy, LA, alumina refinery; a 65% interest in Alumina Partners of Jamaica (Alpart); a 49% interest in Kaiser Jamaica Bauxite Co. (KJBC); and a 49% interest in the Anglesey, United Kingdom, primary aluminum smelter. Alpart operated a bauxite mine and a 1.45-Mt/yr alumina refinery in Nain, Jamaica. KJBC produced about 4 Mt/yr of bauxite, about 60% of which was shipped to Gramercy (Mining Journal, 2003f).

GEO Specialty Chemicals Inc. started production of alumina chemicals at its new plant in Lake Charles, LA. The plant was expected to predominantly produce sodium aluminate, which could be used by the catalyst, pulp and paper, titanium dioxide, and water treatment industries (Industrial Minerals, 2003b).

Sherwin Alumina and Nabaltec GmbH of Schwandorf, Germany, signed a memorandum of understanding to establish a joint-venture company, Nashtec LP. Nashtec would build and operate a 23,000-t/yr specialty alumina plant at Sherwin's Corpus Christi site with an anticipated mid-2005 startup date (Sherwin Alumina Company, 2003).

Alcoa announced the sale of Alcoa Specialty Chemicals (ASC) to Rhone Capital LLC. ASC operated 11 facilities in 6 countries. In addition to facilities in North America, Europe, Japan, and an equity stake in Australia, ASC operated production and processing centers in the growing markets of China and India. ASC products were used by the automotive, cement, ceramics, electronics, plastics, and steel industries (Alcoa Inc., 2003a).

Consumption

Bauxite.—Total domestic consumption of bauxite increased by about 12% compared with that of 2002. In 2003, 94% of the bauxite consumed in the United States was refined to alumina [an estimated 2.1 metric tons (t) of dried bauxite was required to produce 1 t 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 voluntary surveys of U.S. operations. One of these surveys is "Bauxite Consumption," sent to 33 operations, 25 of which responded, representing 99% of the bauxite consumed for uses other than cement listed in table 4.

Alumina.—An estimated 91% of the alumina shipped by U.S. alumina plants went to primary aluminum smelters for metal production. In 2003, 15 domestic primary aluminum smelters consumed 4.95 million metric tons (Mt) of alumina. Consumption in various forms by the abrasives, chemicals, refractories, and specialties industries accounted for the remainder of U.S. alumina use.

Prices

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

Industrial Minerals (2003c) quoted end-of-year prices for several types of imported refractory-grade bauxite from Brazil, China, and Guyana. The price range for bulk Brazilian refractory-grade bauxite was $115 to $130 per metric ton, free on board (f.o.b.) Brazil. The price quotes for Chinese refractory-grade bauxite, minimum 87% Al_2O_3 f.o.b. Chinese ports, were as follows: Shanxi, shaft, lump, $68 to $78 per ton; Shanxi, rotary, lump, $84 to $92 per ton; and Guizhou, rotary, lump, $84 to $92 per ton. The price range for Guyanese refractory-grade bauxite was $160 to $170 per ton, f.o.b. barge, U.S. Gulf Coast. The 2003 annual average values of U.S. imports of metallurgical-grade bauxite are listed in table 7.

The market or spot prices for alumina increased dramatically in 2003 owing to tight global supplies and strong demand from China. According to Metal Bulletin, metallurgical-grade alumina spot prices on international markets began 2003 at $175 to $190 per ton. The price range trended upward during the year and had reached $330 to $350 per ton by yearend. Trade data released by the U.S. Census Bureau indicated that the 2003 average annual value of U.S. imports of calcined alumina was $215 per ton, free alongside ship (f.a.s.) port of shipment, and $225 per ton, cost, insurance, and freight (c.i.f.) U.S. ports.

Trade

In addition to the materials listed in tables 8-10, various specialty aluminum compounds were also traded. The compounds exported in 2003 included 14,800 t of aluminum chloride; 12,200 t of fluoride-based compounds of aluminum, including synthetic cryolite and aluminum fluoride; 11,800 t of aluminum oxide abrasives; and 9,210 t of aluminum sulfate. The compounds imported in 2003 included 164,000 t of aluminum oxide abrasives, 10,100 t of fluoride-based aluminum compounds, 5,360 t of aluminum sulfate, and 883 t of aluminum chloride.

World Industry Structure

In 2003, world production of bauxite increased by 2% compared with that of 2002 (table 11). Mine production was reported in 22 countries, and total world production amounted to more than 146 Mt. The leading producers of bauxite, in decreasing order of tonnage mined, continued to be Australia, Guinea, Jamaica, and Brazil, which accounted for about two-thirds of total world production.

World output of alumina increased by 3% in 2003 compared with that of 2002 (table 12). The four principal producing countries, in order of quantity of alumina produced, were Australia, China, the United States, and Brazil. These countries

[1]A reference that includes a section mark (§) is found in the Internet Reference Cited section.

accounted for about 57% of the world's production; Australia alone accounted for about 30%.

Industry Mergers.—On July 7, Alcan Inc. announced an unsolicited offer to acquire Pechiney securities. In August, Alcan received clearance from the French Government to proceed with the purchase. In September, the European Commission granted acquisition clearance subject to certain commitments and conditions, including the licensing of alumina refining technology, aluminum smelter cell technology, and anode baking furnace designs. The U.S. Department of Justice granted clearance for the acquisition upon the condition that Alcan divest itself of Pechiney's aluminum rolling mill located in Ravenswood, WV. By the beginning of 2004, Alcan had completed the purchase of all outstanding Pechiney securities, and Pechiney became an Alcan subsidiary. As a result of the acquisition, Alcan increased its ownership to 41.4% from 21.4% in Queensland Alumina Ltd. (Australia) and to 43% from 33% in Halco (Mining) Inc.; Halco held a 51% interest in Compagnie de Bauxites de Guinée (CBG), the remaining 49% being held by the Republic of Guinea. Thus, Alcan went to a 22% equity interest in CBG from an effective 17% interest. Pechiney also owned and operated the 650,000-t/yr Gardanne alumina refinery in France; the 17,000-t/yr specialty alumina plant in Teutschental, Germany; and a 60.2% interest in both the Delphi-Distomon bauxite mines and the 750,000-t/yr Saint Nicolas alumina refinery in Greece (Alcan Inc., 2004, p. 10-16, 32-35).

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Australia.—Comalco Aluminium Ltd. (a wholly owned subsidiary of Rio Tinto Ltd.) signed a long-term sales agreement to supply 500,000 t/yr of alumina to Hydro Aluminium from 2006 to 2030. Deliveries were expected to start in 2005 at 300,000 t/yr. The alumina would be supplied from Comalco's new refinery in Gladstone, Queensland, scheduled to begin shipments in 2005, and from Comalco's 38.6% interest in the existing 3.65-Mt/yr Gladstone refinery. Hydro reported that the alumina would be used to feed its Kurri Kurri and Tomago smelters in New South Wales (Hydro Aluminium, 2003). Comalco also announced plans to expand mine capacity at Weipa to 16.6 Mt/yr from 11.5 Mt/yr in order to provide sufficient ore for the new Gladstone refinery (Clarke, 2003).

Alumina Ltd., the resultant alumina venture from the demerger of Western Mining Corporation, purchased QBE Insurance Group's 0.75% share in Alcoa of Australia. The purchase increased Alumina Ltd.'s share in Alcoa of Australia to 40% from 39.25%, matching its 40:60 split with Alcoa in the Alcoa World Alumina and Chemicals (AWAC) joint venture (Mining Journal, 2003a).

Alcan selected LSL Joint Venture (a newly formed, unincorporated joint venture between the Australian construction company Leighton Contractors Pty Limited and an Australian subsidiary of the Canadian engineering and construction firm SNC-Lavalin Group Inc.) to prepare a feasibility study for the proposed expansion of Alcan's alumina refinery at Gove in the Northern Territory. The proposed expansion would increase capacity at Gove from 2 Mt/yr to approximately 3.5 Mt/yr (Alcan Inc., 2003).

AWAC announced plans for an efficiency upgrade at its Pinjarra alumina refinery in Western Australia that would increase capacity from 3.4 Mt/yr to 4.0 Mt/yr. Engineering work was underway and, pending final government approvals, the $270 million project could be completed by 2005 (Alcoa Inc., 2003c).

Kobe Steel announced the sale of its 30% interest in the Kobe Alumina Associates (KAA) consortium to the other members, Nissho Iwai Corp. and Itochu Corp. KAA owned a 10% interest in the 3.2-Mt/yr Worsley alumina refinery in Western Australia (Metal Bulletin, 2003b).

Bosnia and Herzegovina.—The Birac alumina refinery in Republika Srpska completed the first stage of its modernization program. One of the 600,000-t/yr plant's four production lines came onstream in September and reportedly was producing at the rate of 12,500 metric tons per month (t/mo). A second line that would increase production levels to 25,000 t/mo was scheduled to start up at yearend. Ukio Banko Investicine Grupe, a Lithuanian venture capital company, acquired a 63.8% controlling interest in the refinery in December 2001 (Metal Bulletin, 2003a).

Brazil.—Alumina do Norte do Brasil SA (Alunorte) commissioned a third, 825,000-t/yr production line that increased capacity at the refinery to approximately 2.4 Mt/yr from 1.6 Mt/yr (Mining Journal, 2003c). The owners of the Alunorte refinery [Companhia Vale do Rio Doce S.A. (CVRD), 57.03%; Norsk Hydro ASA, 34.03%; Nippon Amazon Aluminium Co. Ltd., 5.32%; and Votorantim Inc., 3.62%] approved the construction of a fourth and fifth production line that would increase capacity by 1.8 Mt/yr to 4.2 Mt/yr. Work on the $583 million project was expected to be completed by yearend 2006. Bauxite for these lines was scheduled to come from development of the new Paragominas Mine, which was wholly owned by CVRD. The property reportedly contained 878 Mt of bauxite. Initial production at the rate of 4.5 Mt/yr was scheduled to coincide with the completion of the refinery expansion (Mining Journal, 2003b). CVRD reported that the refinery expansion was proceeding as scheduled despite a delay in the approval of an environmental permit for the Paragominas Mine (Kinch, 2003).

Alcoa acquired the Camargo Correa Group's 40.9% interest in its South American operations that included businesses in Argentina, Brazil, Chile, Colombia, Peru, Uruguay, and Venezuela. The largest subsidiary in the group was Alcoa Aluminio S.A., which was headquartered in Sao Paulo and operated mining, refining, smelting, and fabrication facilities at various locations in Brazil (Alcoa Inc., 2003b).

China.—Aluminum Corp. of China (Chalco) completed the Phase 2 expansion of its Pingguo alumina refinery, which increased the plant's capacity by 400,000 t/yr to 850,000 t/yr of alumina (Platts Metals Week, 2003).

Guinea.—Guinea Aluminium Products Co. (Gapco) announced plans to build a 2.6-Mt/yr alumina refinery near the Sangaredi bauxite mine in the eastern region of Boke. Sangaredi was operated by CBG, a joint venture that was 49% owned by the Government of Guinea and 51% by Halco (a consortium run by Alcan, Alcoa, and Pechiney). Gapco was seeking to arrange financing for the $2.2 billion project (American Metal Market, 2003).

Russian Aluminum Company (Rusal) gained control of Alumina Co. of Guinea, which held a 23-year lease on the Friguia alumina refinery complex. The complex comprised a bauxite mine and a 700,000-t/yr alumina refinery. Rusal announced plans to expand capacity at Friguia to 1.2 Mt/yr. In 2001, Rusal signed a 25-year agreement to manage Société des Bauxite de Kindia, which operated bauxite mines northeast of Conakry. The agreement included plans to invest $40 million during the next 3 years to increase mine production to about 3 Mt/yr from 1.5 Mt/yr (Mining Journal, 2003g).

Guyana.—Cambior Inc. of Canada assumed management of the bauxite operations of Linden Mining Enterprise Ltd. (Linmine) on a contractual basis through its subsidiary Omai Bauxite Co. Cambior was expected to manage bauxite production and processing, maintenance, marketing, and shipping on a direct charge basis (Taylor, 2003).

India.—Hindalco Industries Ltd. completed the expansion of its facilities at Renukoot in the State of Uttar Pradesh. The project increased the alumina refinery capacity to 660,000 t/yr and the smelter capacity to 345,000 t/yr. By removing process bottlenecks, Hindalco planned to further increase capacity at the complex to 700,000 t/yr of alumina and 360,000 t/yr of metal by mid-2005 (Mining Journal, 2003e).

Sterlite Industries Ltd. signed a memorandum of understanding with the Government of the State of Orissa to construct an alumina and bauxite complex at Lanjigarh. The refinery was expected to have an initial capacity of 1 Mt/yr. The bauxite deposits in the area reportedly contained about 120 Mt of bauxite (Metal Bulletin, 2003c).

Jamaica.—Alcoa completed a 250,000-t/yr expansion at its Jamaica Alumina Co. (Jamalco) refinery in Clarendon that increased capacity to 1.25 Mt/yr and removed a nearly 30-year-old levy on bauxite production, the result of a previous agreement with the Government. Jamalco was a 50-50 joint venture between Alcoa and the Government of Jamaica (Alcoa Inc., 2003c).

Kazakhstan.—Switzerland's Corica AG (a subsidiary of J&W Investment Group) purchased a 31.76% share of Aluminum of Kazakhstan, which controlled the 1.5-Mt/yr Pavlodar alumina refinery and the Torgai and Red October bauxite mines. A condition of the sale was a commitment to build a 240,000-t/yr aluminum smelter, which would be Kazakhstan's first, in the Pavlodar region using locally produced alumina and electricity. In November, the Government reported that the feasibility study for the smelter had been completed and the smelter site selected. The smelter was expected to be built in three stages. The first 60,000 t/yr of capacity was scheduled to be completed by yearend 2007 as required by the agreement. Capacity would increase to 120,000 t/yr in the second stage and to 240,000 t/yr in the final stage (Interfax Mining & Metals Report, 2003a, b).

Russia.—Boxitogorsky Glinozem, which produced alumina trihydrate, white fused alumina, and other specialty grades of alumina at the Boxitogorsk alumina plant in the Leningrad region of Russia, acquired a substantial part of the equipment from Alcan's Burntisland plant in Scotland, United Kingdom. The Burntisland plant had closed at yearend 2002. Boxitogorsky planned to use the purchased equipment to produce the same range of products that had been produced by Alcan (Industrial Minerals, 2003a).

Suriname.—Alcoa (55%) and BHP Billiton (45%) [joint owners of Suriname Aluminum Company, L.L.C. (Suralco)] broke ground on a $65 million expansion of the Paranam alumina refinery. Upon completion of the 250,000-t/yr expansion, scheduled for July 2005, capacity at the refinery would increase to approximately 2.2 Mt/yr (Alcoa Inc., 2003c).

Vietnam.—Chalco reportedly agreed to join a Chinese Government initiative to develop a bauxite mine and alumina refinery in the Dac Nong District of Vietnam. The project in the Central Highlands was expected to be developed in conjunction with the China Non-ferrous Mining and Construction Group and Vietnam National Mineral Corporation (Vimico) (Mining Journal, 2003d).

Outlook

As the world economies continued to recover, world demand for aluminum was expected to increase. In the short term, demand could outstrip supply. The uncertainty for aluminum as well as for many other mineral commodities was China. China's demand for aluminum, in recent years, grew at double-digit rates. There have been some signs, however, that the rate of increase in consumption may be slowing slightly. Reported shortages in power generation could also lead to a decrease in China's aluminum metal production. In the near term, however, announced expansions in worldwide smelter production should be adequate to meet the anticipated demand growth.

World alumina supplies were limited during most of 2004, which promoted a market situation that was extremely sensitive to any supply disruptions, such as those that occurred in the Caribbean, or shifts in the buying patterns of consumers, especially those in China. This market sensitivity was likely to continue in the near term or until metal market growth slows and alumina expansion projects are completed.

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TABLE 1
SALIENT BAUXITE STATISTICS[1]

(Thousand metric tons)

	1999	2000	2001	2002	2003
United States:					
Production, crude ore (dry equivalent):					
Quantity	NA	NA	NA	NA	NA
Value	NA	NA	NA	NA	NA
Exports (as shipped):					
Crude and dried	115	133	67	27	55
Calcined	34	9	14	15	22
Imports for consumption (as shipped):					
Crude and dried	9,890	8,550	8,300	7,340	8,390
Calcined	299	310	242	237	307
Consumption (dry equivalent)	11,700	10,800	9,770	9,980 r	11,200
World, production	129,000	136,000	138,000 r	143,000 r	146,000 e

eEstimated. rRevised. NA Not available.
[1]Data are rounded to no more than three significant digits.

TABLE 2
ESTIMATED 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:				
2002	3,930	605	4,540	4,340
2003	4,350	709	5,060	4,830
Shipments:				
2002	3,900	610	4,510	4,310
2003	4,380	713	5,090	4,860

[1]Data are rounded to no more than 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	2002	2003
Alcoa Inc., Point Comfort, TX	2,300	2,300
BPU Reynolds, Inc., Corpus Christi, TX	1,600	1,600
Kaiser Aluminum & Chemical Corp., Gramercy, LA	1,250	1,250
Ormet Corp., Burnside, LA	600	600
Total	5,750	5,750

[1]Capacity may vary depending on the bauxite used.
[2]Data are rounded to no more than 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	2002	2003
Abrasive	52	53
Alumina	9,290	10,600
Cement[2]	335 r	333
Chemical	W	W
Refractory	115	150
Other[3]	183	112
Total	9,980 r	11,200

rRevised. W Withheld to avoid disclosing company proprietary data, included with "Other."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Data from the D15-Cement Annual Survey Form, U.S. Geological Survey Form 9-4041-A.
[3]Includes municipal water works, oil, and steel and ferroalloys.

TABLE 5
STOCKS OF BAUXITE IN THE UNITED STATES, DECEMBER 31[1, 2]

(Thousand metric tons, dry equivalent)

Sector	2002	2003
Producers, processors, consumers	1,280 [r]	959
Government	1,770	66
Total	3,050 [r]	1,030

[r]Revised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Domestic and foreign bauxite; crude, dried, calcined, activated, all grades.

TABLE 6
STOCKS OF ALUMINA IN THE UNITED STATES, DECEMBER 31[1, 2]

(Thousand metric tons, calcined equivalent)

Sector	2002	2003
Producers	337	312
Primary aluminum plants	1,070	935
Total	1,410	1,250

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Excludes consumers stocks other than those at primary aluminum plants.

TABLE 7
AVERAGE VALUE OF U.S. IMPORTS OF CRUDE AND DRIED BAUXITE[1]

(Dollars per metric ton)

	2002		2003	
Country	Port of shipment, free alongside ship (f.a.s.)	Delivered to U.S. ports, cost, insurance, and freight (c.i.f.)	Port of shipment, f.a.s.	Delivered to U.S. ports, c.i.f.
Australia	12.82	23.67	16.91	41.19
Brazil	22.85	29.19	20.45	27.02
Guinea	22.52	28.31	20.04	26.24
Guyana	26.14	34.54	25.24	32.56
Jamaica	17.50	19.51	17.30	19.79
Average, weighted	20.35	24.66	19.48	24.53

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

TABLE 8
U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF CRUDE AND DRIED BAUXITE, BY COUNTRY[1]

(Thousand metric tons)

Country	2002	2003
Imports:		
Australia	113	96
Brazil	212	837
Guinea	2,200	2,870
Guyana	692	736
Jamaica[2]	4,070	3,810
Other	57	44
Total[3]	7,340	8,390
Exports:		
Canada	26	17
China	(3)	35
Mexico	(3)	(3)
Other	1	3
Total	27	55

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Dry equivalent of shipments to the United States.
[3]Less than 1/2 unit.

Note: Total U.S. imports of crude and dried bauxite as reported by the U.S. Census Bureau were as follows: 2002--6.43 million metric tons (Mt) and 2003--7.70 Mt.

Sources: U.S. Census Bureau and the Jamaica Bauxite Institute.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF CALCINED BAUXITE, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

	2002				2003			
	Refractory grade		Other grade		Refractory grade		Other grade	
Country	Quantity	Value[2]	Quantity	Value[2]	Quantity	Value[2]	Quantity	Value[2]
Imports:								
Australia	--	--	47	4,290	--	--	70	6,330
Brazil	5	504	5	710	3	355	14	1,030
China	97	7,560	67	4,970	69	5,730	102	8,040
Guyana	8	868	8	1,290	17	2,150	31	2,010
Other	(3)	10	(3)	26	(3)	17	(3)	10
Total	110	8,950	127	11,300	90	8,250	217	17,400
Exports:								
Canada	2	396	7	533	2	431	4	392
Japan	--	--	(3)	85	(3)	4	--	--
Mexico	5	501	(3)	34	7	988	7	1,010
Other	1	361	1	213	1	582	(3)	7
Total	7	1,260	8	865	11	2,010	11	1,410

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Value at foreign port of shipment as reported to the U.S. Customs Service.
[3]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 10

U.S. IMPORTS FOR CONSUMPTION AND EXPORTS OF ALUMINA, BY COUNTRY[1]

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

Country	2002		2003	
	Quantity	Value[2]	Quantity	Value[2]
Imports:				
Australia	1,740	271,000	962	163,000
Brazil	65	12,700	78	21,800
Canada	90	58,000	95	63,100
China	28	8,920	26	8,260
France	11	15,800	12	17,800
Germany	40	68,500	40	74,600
Jamaica	293	49,700	361	72,300
Japan	6	15,200	6	13,500
Suriname	704	108,000	719	121,000
Venezuela	(3)	81	2	1,770
Other	30	24,600	11	13,500
Total	3,010	633,000	2,310	571,000
Exports:				
Brazil	1	2,700	2	2,510
Canada	1,110	202,000	897	198,000
China	2	1,720	35	11,400
Finland	(3)	372	(3)	125
Mexico	68	25,000	38	22,100
Netherlands	3	4,870	1	7,640
Norway	32	4,570	63	9,890
Russia	(3)	179	(3)	536
Sweden	1	1,350	1	1,510
Other	55	119,000	52	114,000
Total	1,270	362,000	1,090	368,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Value at foreign port of shipment as reported to the U.S. Customs Service.

[3]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 11
BAUXITE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country	1999	2000	2001	2002	2003
Australia	48,416	53,802	53,799 r	54,024	55,602
Bosnia and Herzegovina[e]	75	75	75	75	100
Brazil	14,372	13,866 r	13,790 r	13,189 r	13,148
China[e]	8,500	9,000	9,800	12,000	12,500
Ghana	355	504	678	684	495
Greece	1,883	1,991	2,052	2,492	2,418
Guinea[3]	15,590	15,700	15,100 r, e	15,300 r, e	15,500 e
Guyana[3]	2,359	2,471	1,950 r	1,690 r	1,500 e
Hungary	935	1,047	1,000	720 r	666
India	6,712	7,562	7,864	9,647 r	10,002
Indonesia	1,116	1,151	1,237	1,283	1,094
Iran	912	400	405 r, e	420 r, e	500 e
Jamaica[3, 4]	11,688	11,127	12,370	13,120 r	13,444
Kazakhstan	3,607	3,730	3,685	4,377	4,737
Malaysia	224	123	64	40	3
Mozambique	8	8	9	9	12
Pakistan	11	9	9 e	8 e	8 e
Russia[e]	3,750	4,200	4,000	3,800	4,000
Serbia and Montenegro	500	630	610	612	600 e
Suriname	3,715 r	3,610	4,394 r	4,002 r	4,215
Turkey[5]	208	459	242	287 r	300 e
United States	NA	NA	NA	NA	NA
Venezuela	4,166	4,361	4,585 r	5,191 r	5,200 e
Total	129,000	136,000	138,000 r	143,000 r	146,000

[e]Estimated. [r]Revised. NA Not available.

[1]World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through July 25, 2004.

[3]Dry bauxite equivalent of crude ore.

[4]Bauxite processed for conversion to alumina in Jamaica plus kiln-dried ore prepared for export.

[5]Public-sector production only.

TABLE 12

ALUMINA: WORLD PRODUCTION, BY COUNTRY[1, 2, 3]

(Thousand metric tons)

Country	1999	2000	2001	2002	2003[e]
Australia	14,532	15,680 [r]	16,313 [r]	16,382	16,529 [4]
Azerbaijan	76	63	95	67 [r]	100
Bosnia and Herzegovina[e]	50	50	50 [4]	50	50
Brazil	3,515	3,743 [r]	3,445 [r]	3,962 [r]	4,000
Canada	1,070 [r]	1,023	1,036	1,125 [r]	1,100
China[e]	3,840	4,330	4,650	5,450	6,140
France[e]	400	200 [4]	150	150	150
Germany	583	700 [e]	520 [r]	550 [r]	550
Greece	626	667	679 [r]	750 [r]	750
Guinea	568	541	674 [r]	670 [r]	732 [4]
Hungary[e]	145 [4]	150	150	150	150
India[e]	2,080	2,280	2,400	2,800 [r]	2,500
Iran	--	--	--	102	200
Ireland[e]	1,200	1,200	1,100	1,100	1,100
Italy[e]	973 [4]	950	500	500	500
Jamaica	3,570	3,600	3,542	3,631	3,844 [4]
Japan[5]	335	369	331	333 [r]	330
Kazakhstan	1,158	1,217	1,231	1,386	1,419 [4]
Romania	277	417	319 [r]	350 [r, e]	350
Russia	2,657	2,850 [e]	3,046	3,131	3,230 [4]
Serbia and Montenegro	156	186	185	180 [r, e]	180
Slovakia[e]	100	110	110	110	110
Slovenia[e]	70	70	34	30	30
Spain[e, 6]	1,200	1,200	1,100	1,100	1,100
Suriname[e]	1,600 [r]	1,800 [r]	1,900 [r]	1,900 [r]	2,000
Turkey	159	155	146 [r]	152 [r]	150
Ukraine	1,230	1,360	1,343	1,351	1,434 [4]
United Kingdom	90	80 [e]	84 [r]	74 [r]	--
United States	5,140	4,790	4,340	4,340	4,830 [4]
Venezuela	1,469	1,755	1,833	2,100	1,900
Total	48,900 [r]	51,500 [r]	51,300 [r]	54,000 [r]	55,500

[e]Estimated. [r]Revised. -- Zero.

[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 no more than three significant digits; may not add to totals shown.

[3]Table includes data available through July 25, 2004.

[4]Reported figure.

[5]Data presented are for alumina used principally for specialty applications. Information on aluminum hydrate for all uses is not adequate to formulate estimates of production levels. Production of aluminum hydroxide, in metric tons: 1999--736,591; 2000--781,690; 2001--739,098; 2002--723,860 (revised); and 2003--725,000 (estimated).

[6]Hydrate.