



# 2006 Minerals Yearbook

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## BARITE

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# BARITE

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In 2006, primary barite production (sold or used by producers) totaled 589,000 metric tons (t) valued at \$23.5 million. Imports were 2.55 million metric tons (Mt), exports were 72,000 t, and apparent consumption was 3.07 Mt.

Barite, a name that was derived from the Greek word *barus* (heavy), is the mineralogical name for barium sulfate. In commerce, the mineral is sometimes referred to as barytes. As used in this report, the term primary barite refers to the first marketable product, which includes crude barite that usually has undergone simple beneficiation methods, such as washing, jigging, and tabling, or more complex methods, such as heavy-media separation, flotation, and magnetic separation. Most crude barite requires some upgrading to minimum purity or density levels.

## Production

Domestic production and sales data for barite were derived from voluntary responses to the U.S. Geological Survey (USGS) canvass of 32 known mines and grinding plants. The USGS received full or partial responses from 30 of the operations, representing 98% of barite sold and used by processors. Seven mines were included in the survey; four were producing and three were idle. Of the producing mines, three were in Nevada, and one was in Georgia; the idle mines were in Nevada and Tennessee. There were 24 grinding plants operating at the end of the reporting year. The Georgia mine and three of the Nevada mines had associated nearby grinding plants, while one small Nevada mine supplied a grinding plant in California. Most ore in Nevada was ground onsite or in California and sold into the petroleum drilling markets of the Western United States and southwestern Canada or to local industrial users.

Crude barite production in 2006 was 589,000 t, an increase of 20% compared with that of 2005. The value of domestic production was \$23.5 million, an increase of about 34%. The bulk of mine production was from Nevada with a small amount reported from Georgia. Nevada's mine production increased by nearly 26%, which included jig plant output and run-of-mine sales. Meanwhile production at Georgia's sole producer, New Riverside Ochre Co., Inc., decreased by 73% after the company decided to exit the ground barite market.

In 2006, there were 14 facilities on the coast of the Gulf of Mexico (6 in Louisiana and 8 in Texas) that produced barite to American Petroleum Institute (API) specifications (of which a minimum specific gravity of 4.20 grams per cubic centimeter is the most important). These stand-alone grinding plants primarily processed imported crude barite from China and India that was ground to API specifications for the oil and gas drilling market. In Louisiana, there were two grinding plants in the Amelia/Morgan City area, one in Houma, one near the Lake Charles/

Westlake area, one in New Iberia, and one near New Orleans. In Texas, there were two grinding plants in Brownsville, three in Corpus Christi, one in Galveston, and two in Houston, at least one of which, in addition to supplying the drilling market, also produced commercial filler-grade barite.

Grinding plants that produce commercial filler-grade barite or chemical-grade barite are located in northern Georgia or in the Mississippi River Valley. There were three mills and one mine in Georgia, and single mills in Illinois, Missouri, and Tennessee. The location of mills near the Mississippi River allowed them to receive imported barite by barge and to ship the finished product by barge, if possible, or by rail or truck to industrial users in the midwestern United States.

In 2006, the leading barite companies that mined and ground barite in the United States were also major oil service companies and included Baker Hughes INTEQ (a division of Baker Hughes Incorporated), Baroid (the drilling fluids and industrial barite subsidiary of Halliburton Energy Services, Inc.), and M-I SWACO (a joint venture between Smith International Inc. and Schlumberger Ltd.). Baker Hughes INTEQ, Halliburton, and M-I SWACO are world renowned and operate in many countries, mining barite and providing drilling sales and services. These three companies operated barite mines with associated beneficiation mills and grinding plants in Nevada and also operated grinding plants in Louisiana and Texas. Excalibar Minerals Inc. (a division of Newpark Resources, Inc. of Houston) was a major barite importer and grinder in Louisiana and Texas for the oil and gas drilling market. The company also operated a grinding plant in Tennessee serving nondrilling markets. There were other, smaller companies near the Gulf of Mexico that received imported barite by ship through ports in Louisiana and Texas. Ambar Drilling Fluids LP in Houma ground imported barite for its service unit. U.S. Clay LP of Birmingham, AL, ground bentonite for its own use in Brownsville and crude barite for other grinding plants (on a toll basis). The other grinding plant in Brownsville is owned by Milwhite, Inc.

After being ground to API specifications, the barite is transferred directly to containers on barges docked in canals, lakes, and rivers near the plants for large-scale deliveries to offshore drilling platforms. These near-shoreline barite staging locations also are closer to the clusters of onshore areas with significant petroleum production in the Petroleum Administration for Defense (PAD) District 3. The PAD districts were World War II divisions of the oil-producing areas of the United States; these designations continue to be used.

Driven by strong demand for barite (primarily in Colorado, Utah, and Wyoming, where the average annual rig count has risen from 81 to 228, in the past 4 years), companies are actively exploring for barite in Nevada. In 2006, Excalibar Minerals

staked nine claims near the south end of the Independence Mountains in Elko County. The claims are in the vicinity of the Heavy Spar barite prospect, which was explored by the Eisenman Chemical Co. in the 1970s, and are near the Maggie Creek portion of the Carlin gold trend. This followed the staking of 30 claims by Excalibar in 2005, in another Elko County barite district. Spirit Minerals LP filed an application for a permit to explore the Big Ledge Mine area in the Snake Mountains of Elko County, an area that was explored by Chromalloy American Corp. in the late 1970s and was later mined by Circle A Construction Inc. in the 1990s. Spirit Minerals also announced plans to mill 75,000 t of stockpiled barite ore mined in the 1980s by Old Soldier Minerals Co. from another property in the area, and staked 38 mill site claims on the east side of the Snake Range. Heemskirk Canada Ltd. leased the Monitor barite property in Northumberland District of Nye County. Milchem Inc. produced barite from the Monitor Mine in the late 1970s (S.B. Castor, Nevada Bureau of Mines and Geology, written commun., September 19, 2007).

### Consumption

In 2006, apparent consumption was essentially unchanged at 3.07 Mt compared with that in 2005 (table 1). Ground barite sales increased by nearly 12% to 3.04 Mt in 2006 from 2.72 Mt in 2005. In 2006, sales by grinding plants in Louisiana increased by 16% to 1.36 Mt, and in Texas by 8% to 1.01 Mt, while sales by grinding plants in all other States increased by nearly 9% to 665,000 t (table 2). About 2.9 Mt, or nearly 96%, of barite sales from domestic crushers and grinders was for petroleum well-drilling markets, and the remaining 4% was for industrial end uses (table 3).

Barite used for drilling petroleum wells can be black, blue, brown, buff, or gray depending on the ore body. Most barite needs to be ground to a small uniform size before it is used as a weighting agent in petroleum well-drilling mud based on specifications set by the API or the former Oil Companies' Materials Association (OCMA).

The barite is finely ground so that at least 97% of the material, by weight, can pass through a 200-mesh (Tyler) [75-micrometer ( $\mu\text{m}$ )] screen, and no more than 30%, by weight, can be less than 6  $\mu\text{m}$ , effective diameter, which is measured using sedimentation techniques. The ground barite also must be dense enough so that its specific gravity is 4.2 or greater, soft enough to not damage the bearings of a tricone drill bit, chemically inert, and containing no more than 250 milligrams per kilogram (mg/kg) of soluble alkaline salts (American Petroleum Institute, 1993, p. 6-11). A small percentage of iron oxide is allowable. An additional benefit of barite is noninterference with magnetic measurements taken in the borehole, either during logging-while-drilling or in separate drill hole logging.

Fueled by the dramatic increase in oil and gas prices and the need to replace declining U.S. reserves, there has been a dramatic increase in domestic exploration (especially for natural gas) since 2002. The total U.S. rig count (operating drilling rigs) has nearly doubled since 2002 to a total of 1,710 in December 2006. This increased drilling activity has pushed domestic barite production up by 40%, and, although imports decreased

slightly in 2006, imports of crude barite have increased by 67% during the same period. The international rig count (excluding Canada, Iran, onshore China, Sudan, and the United States) has increased by 26%. As has been the case since the late 1990s, consumption of barite in well drilling in the United States was driven primarily by the demand for natural gas. At the end of 2006, 83% of drill rigs operating in the United States (onshore and offshore) were drilling for gas (Baker Hughes Incorporated, 2007).

Besides traditional gas-producing areas, such as the Gulf of Mexico and Texas, natural gas reserves in the Rocky Mountain States account for nearly 22% of the total natural gas reserves in the United States, and are mostly located in unconventional tight-gas or coal bed formations. Dry natural gas production in Colorado, Utah, and Wyoming has increased from an average of 5.49 billion cubic feet per day (Bcf/d) in 2000 to 8.61 Bcf/d in 2006 (U.S. Department of Energy, Energy Information Administration, 2007). It is this development that is driving demand for barite in the Rocky Mountain States and the accompanying interest in developing new barite mines.

In 2006, sales of domestic and imported barite sold for industrial uses decreased by 9% to 129,000 t (table 3). Industrial end uses such as barium chemicals (the largest by volume is barium carbonate), filler in paint and plastics, and powder coatings all require the barite to be ground to a small uniform size. The size depends on the use, but for paint- and plastic-grade material, it averages about 2 to 3  $\mu\text{m}$ . Barite-containing materials that are used for sound reduction in engine compartments are gaining market share among automotive manufacturers. Barite also is used in the base coat of automobile finishes for smoothness and corrosion resistance and continues to be used in friction products for automobiles and trucks.

Barite that is used as an aggregate in "heavy" cement or radiation shielding cement is crushed and screened to sizes ranging from 4.75 millimeters (0.187 inches) to 3.75 centimeters (1.5 inches) for the coarse grade. New Riverside Ochre is the primary supplier of barite aggregate.

### Foreign Trade

Barite exports during 2006 decreased by 23% to 71,500 t. About 95% of the total was exported to Canada, about 3% went to Mexico, and the remaining 2% went to other countries (table 4). Imports of crude natural barite decreased slightly to 2.53 Mt; imports came from China (94%), India (5%), and Morocco (1%). Imports of ground barite decreased to 815 t in 2006 from 84,000 t in 2005. Imports for the several forms of barite reported under the HTS nomenclature "Other sulfates of barite" decreased by 22% to 22,400 t (table 5). Crude natural barite was imported into the United States through ports in Louisiana (1.49 Mt) and Texas (1.04 Mt).

### Prices

The average sales value per ton for primary barite from mines and their associated beneficiation plants in the United States increased to \$39.98 per metric ton, an increase of 11% compared with that of 2005 (table 1). The average sales value

for drilling-grade barite ground in Louisiana increased by nearly 8% to \$96.83, while the sales value of barite ground in Texas (the majority of which was drilling grade) increased slightly to \$86.27 per ton. The sales value of barite ground in other States increased by 23% to \$104.29 per ton compared with the 2005 values (table 2). Barite for barium chemicals, filler and extender, and glass increased by 44% to \$280 per ton for 2006 (table 3).

According to Industrial Minerals, December U.S. import prices for Chinese barite, API grade, lump, including cost, insurance, and freight, U.S. Gulf Coast, were in a range of \$71 to \$74 per ton. This was an increase of more than \$10 per ton compared with the same period in 2005. Prices for Indian barite increased by a similar amount; December 2006 import prices were listed at a range of \$82 to \$85 per ton. Moroccan barite was unchanged at \$67 to \$69 per ton. Ground, OCMA, bulk, delivered to Aberdeen [United Kingdom] was unchanged at £60 to £65 per ton (about \$118 to \$127 per ton based on the average December 2006 exchange rate). Micronized, off white, minimum 99% less than 20 µm, delivered to the United Kingdom also was unchanged at £140 to £150 per ton (about \$274 to \$294 per ton) (Industrial Minerals, 2006d).

The causes behind the recent large increases in imported barite prices involved several different factors that ranged from supply pressures to transportation problems (international and domestic) to monetary (currency exchange rates and taxes). These factors involve the major exporting countries of China, India, and Morocco, as well as major consumers such as the United States.

On the supply side, some high-grade barite deposits in China capable of supplying API-grade material for export have been depleted, and, until recently, it was the Government's policy for domestic consumers to use barite below the API 4.2 specific gravity specification, leaving higher grades for export, but this is no longer the case. Additional mine capacity is being developed, but the new mines are underground and therefore costs will be higher. India, the second largest exporter after China, produces all of its barite from a single deposit in the Cuddapah region of Andhra Pradesh State. More than 90% of production comes from the State-owned Andhra Pradesh Mineral Development Corp., and the Government continued to closely control production, export volumes, and prices. India saw a dramatic increase in barite prices as a result of its last 3-year tender in 2004. In 2006, Indian production was reduced owing to severe flooding in November 2005 that curtailed mining until mid-April 2006.

Transportation was certainly one of the major causes of higher prices. Most of the barite imported from China is shipped in a class of vessels called Panamax (the largest size capable of passing through the Panama Canal). The Panamax index, which tracks maritime shipping rates for Panamax vessels, more than doubled between the middle of February 2006 and the end of the year. Availability of ships is also a problem; China's appetite for raw materials has tied up a large portion of the world's bulk-vessel fleet. This has adversely affected India's barite exports as well, because of reduced ship availability and resulting higher freight rates. In addition, complying with stringent regulations imposed by the U.S. Coast Guard and U.S. Customs and Border

Protection has resulted in reduced interest by some ship owners to move vessels to the U.S. Gulf Coast. On the domestic front, disruptions in recent years can be traced back to the effects of hurricanes Katrina and Rita, which caused congestion in various Gulf ports and has adversely affected the availability of barges used to unload ships. Rail congestion and high fuel prices have led to higher truck rates, resulting in substantial increases in the delivered cost of ground barite to onshore customers.

Prices received a boost from changes in the currency exchange rates when China devalued its currency by 6% in mid-2005 from RMB8.30 per U.S. dollar to RMB7.80 per U.S. dollar at yearend 2006. Prices for Chinese barite also increased when the Chinese Government first reduced the value added tax rebate from 13% to 5%, and then eliminated it entirely effective December 15, 2006 (Industrial Minerals, 2006a; Mills, 2007; Tran, 2007).

## World Review

**Canada.**—Atlantic Barite Ltd. reactivated the idle Buchans flotation mill in Newfoundland, which last operated in the 1980s, to produce barite for drilling mud to service the oil and gas industry exploring offshore Newfoundland and Labrador. The mill processed tailings of the former Buchans Mine, a base-metal mine operated by Asarco Ltd. between 1929 and 1984 at Red Indian Lake in the central part of the Province. The deposit contains 1.5 Mt of recoverable material grading 30% barite. The company produced a trial product batch in 2005 and began production in 2006. The plant will have the capacity to produce 15,000 to 25,000 metric tons per year (t/yr) of barite, with a mine life of 15 to 20 years (Industrial Minerals, 2006b).

CIMBAR Performance Minerals Inc. acquired the industrial barite segment of Dynatec Corp.'s Mineral Products Division. The acquisition included barite activities operated by Dynatec's Canada Talc division, but did not include its talc and dolomite operations nor its interest in a Chinese micronized barite joint venture. CIMBAR planned to phase out production of micronized barite grades at Canada Talc's Marmora, Ontario, production facility and transfer production of those grades to either its Georgia or Texas operations. Production and shipments of coarse-grade barite products would continue at the Marmora facility. The acquisition was a natural extension of CIMBAR's barite product lines; the company offers a wide range of barium sulfate products used in coating, fillers, and pigments (Industrial Minerals, 2006c).

**Vietnam.**—Vietnam's barite output has increased from essentially zero in the late 1990s to its current level of about 120,000 t/yr. At present, all production is from mines working residual deposits in the Tuyen Quang Province area, but deposits also exist in the Lang Boc area of Habac Province. In 2006, mining and grinding was carried out by three companies—Drilling Mud Co. (subsidiary of Vietnam Oil and Gas Corp.), Hoa An Co. (privately owned), and TQM Co. (State owned and based in Tuyen Quang). These three companies produced about 20,000 t of barite for consumption in offshore oil and gas exploration in southern Vietnam near Vũng Tàu; the rest was exported in either bulk or ground form, with Indonesia the largest export market (Tran, 2007).

## Outlook

High oil and gas prices and strong demand will continue to push exploration of domestic oil and gas resources. Through the third quarter of 2007, the U.S. rig count continued to rise and averaged 1,760 rigs per month, an increase of about 7% compared with the 2006 monthly average of 1,649 (Baker Hughes Incorporated, 2007). Most of the domestically mined barite will continue to be consumed in the Rocky Mountain region. According to recent assessments performed by the USGS, there are large quantities of undiscovered oil and gas resources in this region. For example, undiscovered oil and gas resources of the Eastern Great Basin (eastern Nevada, western Utah, and part of southeastern Idaho) are estimated at 1.6 billion barrels of oil and 1.8 trillion cubic feet of natural gas remaining to be found in this region (U.S. Geological Survey, 2005). The continued growth in exploration in this area will not only consume the output of existing Nevada mines but also will fuel the exploration for barite and the development of new barite mines to meet the rising demand and to replace depleted reserves.

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TABLE 1  
SALIENT BARITE STATISTICS<sup>1</sup>

(Thousand metric tons and thousand dollars)

	2002	2003	2004	2005	2006
United States:					
Barite, primary:					
Sold or used by producers:					
Quantity	420	468	532	489	589
Value	12,200	13,900	18,700	17,600	23,500
Exports:					
Quantity	47	44	70	93	72
Value	4,230	4,620	6,400	9,930	11,900
Imports for consumption: <sup>2</sup>					
Quantity	1,540	1,650	2,000	2,690	2,550
Value	81,300	85,500	109,000	162,000	160,000
Consumption, apparent <sup>3</sup>	1,920	2,080	2,460	3,080	3,070
Crushed and ground, sold or used by processors: <sup>4</sup>					
Quantity	1,980	2,230	2,440	2,720	3,040
Value	151,000	165,000	208,000	238,000	289,000
World, production	6,160 <sup>r</sup>	6,780 <sup>r</sup>	7,760 <sup>r</sup>	8,110 <sup>r</sup>	7,960 <sup>c</sup>

<sup>c</sup>Estimated. <sup>r</sup>Revised.

<sup>1</sup>Data are rounded to no more than three significant digits.

<sup>2</sup>Includes crude, ground, and other barite imports.

<sup>3</sup>Sold or used plus imports minus exports.

<sup>4</sup>Includes imports.

TABLE 2  
CRUSHED AND GROUND BARITE SOLD OR USED BY PROCESSORS IN THE UNITED STATES, BY STATE<sup>1,2</sup>

State	2005			2006		
	Number of plants	Quantity (thousand metric tons)	Value (thousands)	Number of plants	Quantity (thousand metric tons)	Value (thousands)
Louisiana	6	1,180	\$106,000	6	1,360	\$132,000
Texas	8	934	80,100	8	1,010	87,300
Other <sup>3</sup>	10	612	51,800	9	665	69,400
Total	24	2,720	238,000	23	3,040	289,000

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes imports.

<sup>3</sup>Includes California, Georgia, Illinois, Missouri, Nevada, and Tennessee.

TABLE 3  
CRUSHED AND GROUND BARITE SOLD OR USED BY PROCESSORS IN THE UNITED STATES, BY USE<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Use	2005		2006	
	Quantity	Value	Quantity	Value
Barium chemicals, filler and/or extender, glass	141	27,400	129	36,100
Well drilling	2,580	210,000	2,910	253,000
Total	2,720	238,000	3,040	289,000

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes imports.

TABLE 4  
U.S. EXPORTS OF NATURAL BARIUM SULFATE (BARITE), BY COUNTRY<sup>1</sup>

Country	2005		2006	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Brazil	25	\$8	4	\$9
Canada	86,700	7,870	68,200	7,120
China	103	77	18	16
Colombia	5	3	20	5
Costa Rica	76	41	--	--
Greece	1	4	--	--
India	3	8	--	--
Japan	37	37	808	3,830
Kuwait	--	--	41	7
Mexico	4,340	1,130	2,090	686
Philippines	10	20	103	165
Singapore	45	8	91	18
Taiwan	16	46	--	--
United Kingdom	--	--	2	11
Venezuela	1,320	677	129	29
Total	92,700	9,930	71,500	11,900

-- Zero.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 5  
U.S. IMPORTS FOR CONSUMPTION OF BARITE, BY COUNTRY<sup>1</sup>

Country	2005		2006	
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
<b>Crude:</b>				
China	2,280,000	\$120,000	2,360,000	\$133,000
India	276,000	16,500	139,000	10,500
Mexico	90	6	3,340	94
Morocco	19,800	1,280	20,200	1,010
Total	2,570,000	137,000	2,530,000	145,000
<b>Ground:</b>				
Canada	--	--	15	2
China	14,400	1,520	--	--
India	44,500	4,230	--	--
Japan	214	32	102	15
Mexico	280	30	698	122
Morocco	24,600	2,440	--	--
Total	84,000	8,250	815	139
<b>Other sulfates of:</b>				
Belgium	210	119	--	--
Canada	106	38	17	6
China	13,700	3,550	6,620	1,890
Finland	1	32	9	43
France	20	12	45	28
Germany	9,900	8,570	10,300	9,050
Italy	3,910	2,410	4,670	2,850
Japan	509	1,070	529	1,140
Korea, Republic of	--	--	42	99
Mexico	108	61	--	--
Spain	148	169	177	153
Switzerland	9	6	16	10
Total	28,600	16,000	22,400	15,300

-- Zero.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Cost, insurance, and freight value.

Source: U.S. Census Bureau; data adjusted by the U.S. Geological Survey.

TABLE 6  
U.S. IMPORTS FOR CONSUMPTION OF BARIUM CHEMICALS<sup>1</sup>

	2005		2006	
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
Chloride	94	\$138	98	\$94
Oxide, hydroxide, peroxide	3,760	3,780	3,580	3,530
Nitrate	3,280	8,570	4,120	7,720
Carbonate, precipitated	6,920	4,150	4,710	4,940

<sup>1</sup>Data are rounded to no more than three significant digits.

<sup>2</sup>Cost, insurance, and freight value.

Source: U.S. Census Bureau.

TABLE 7  
BARITE: WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

Country	2002	2003	2004	2005	2006 <sup>c</sup>
Afghanistan <sup>e,3</sup>	2,000	2,000	2,000	1,500	1,500
Algeria	51,733	45,649	47,945	52,813	53,000
Argentina	3,048	6,934	2,762	3,910 <sup>r</sup>	4,000
Australia <sup>c</sup>	20,000	20,000	20,000	20,000	21,000
Belgium <sup>e</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	--
Bolivia	15,556	1,851	5,774	11,379 <sup>r</sup>	7,400
Bosnia and Herzegovina <sup>c</sup>	2,000	1,851 <sup>4</sup>	1,900 <sup>4</sup>	160 <sup>r</sup>	200
Brazil, beneficiated	53,098	57,452	59,612	44,041 <sup>r</sup>	50,000
Bulgaria <sup>e,5</sup>	123,000 <sup>r,4</sup>	91,200 <sup>r</sup>	75,400 <sup>r</sup>	79,500 <sup>r</sup>	80,000
Burma	15,050	4,850	2,224	2,058 <sup>r</sup>	2,000
Canada	17,417	27,369	20,601	21,000	21,000
Chile <sup>c</sup>	384	229	31	91 <sup>r,4</sup>	100
China <sup>c</sup>	3,100,000	3,600,000	3,900,000	4,200,000	4,400,000
Colombia <sup>c</sup>	600	600	600	600	600
Ecuador <sup>c</sup>	1,180	2,139	3,695 <sup>r,4</sup>	3,879 <sup>r,4</sup>	3,500
Egypt <sup>c</sup>	500	500	500	500	500
France	80,000	81,000	82,000 <sup>e</sup>	82,000 <sup>e</sup>	30,000
Georgia <sup>c</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	--
Germany, marketable Ba <sub>2</sub> SO <sub>4</sub>	100,993	109,506	93,624	88,591 <sup>r</sup>	90,000
Greece, crude ore <sup>c</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	--
Guatemala <sup>c</sup>	100	100	70 <sup>4</sup>	181 <sup>r,4</sup>	150
India <sup>c</sup>	675,000 <sup>r</sup>	723,000 <sup>r</sup>	1,100,000 <sup>r</sup>	1,200,000 <sup>r</sup>	950,000
Iran <sup>3</sup>	178,652	196,169	275,607	280,000 <sup>e</sup>	290,000
Italy <sup>c</sup>	10,215 <sup>r</sup>	12,214 <sup>r</sup>	9,608 <sup>r</sup>	12,000	10,000
Kazakhstan <sup>6</sup>	79,000	79,000	120,000	120,000	120,000
Korea, North <sup>c</sup>	-- <sup>r</sup>	--	-- <sup>e</sup>	--	--
Korea, Republic of	78	140	50	-- <sup>r</sup>	--
Laos	12,695	18,070	10,470 <sup>e</sup>	950 <sup>r</sup>	10,000
Malaysia	3,082	--	-- <sup>e</sup>	--	--
Mexico	163,620	287,451	306,668	268,657 <sup>r</sup>	206,106 <sup>p</sup>
Morocco	469,934	358,500	355,800	475,700 <sup>r</sup>	350,000
Nigeria <sup>c,7</sup>	20,000 <sup>r</sup>	20,000 <sup>r</sup>	20,000 <sup>r</sup>	20,000 <sup>r</sup>	20,000
Pakistan <sup>c</sup>	21,451 <sup>r</sup>	40,745 <sup>r</sup>	44,207 <sup>r</sup>	42,087 <sup>r</sup>	43,000
Peru	3,806	2,906	3,606	3,700	3,700 <sup>p</sup>
Poland	2,700	2,900 <sup>r</sup>	3,183 <sup>r</sup>	2,357 <sup>r</sup>	3,000
Romania, processed	100	-- <sup>r</sup>	-- <sup>r</sup>	-- <sup>r</sup>	--
Russia <sup>c</sup>	59,000	78,000	63,000	63,000	63,000
Saudi Arabia <sup>c</sup>	9,000	9,000	15,000 <sup>r,4</sup>	15,000 <sup>r,4</sup>	16,000
Slovakia, concentrate	25,800 <sup>r</sup>	12,000 <sup>r</sup>	27,100 <sup>r</sup>	12,000 <sup>r</sup>	15,000
Spain, marketable Ba <sub>2</sub> SO <sub>4</sub>	52,494	44,660	40,776 <sup>r</sup>	37,000 <sup>r</sup>	35,000
Thailand	137,469	115,600	211,278	120,000 <sup>e</sup>	120,000
Tunisia	5,539	3,000	1,813	--	--
Turkey	106,843	119,648	134,504	157,179 <sup>r</sup>	180,000
United Kingdom <sup>c</sup>	59,000 <sup>r</sup>	57,000 <sup>r</sup>	61,000 <sup>r</sup>	62,000 <sup>r</sup>	50,000
United States <sup>8</sup>	420,000	468,000	532,000	489,000	589,000 <sup>4</sup>
Vietnam	60,228	81,456	101,040	116,000	120,000
Total	6,160,000 <sup>r</sup>	6,780,000 <sup>r</sup>	7,760,000 <sup>r</sup>	8,110,000 <sup>r</sup>	7,960,000

<sup>c</sup>Estimated. <sup>p</sup>Preliminary. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Table includes data available through June 10, 2007.

<sup>3</sup>Data are for fiscal year beginning March 21 of that stated.

<sup>4</sup>Reported figure.

<sup>5</sup>Marketable concentrate based on reported or estimated noncountry data but is in accord with the trends in reported Bulgarian raw barite production.

<sup>6</sup>Estimated marketable barite, however, reported figures are as follows, in metric tons: 2002—154,500; 2003—214,200; 2004—310,700; 2005—251,000; and 2006—251,000.

<sup>7</sup>Considerably more barite is produced, but it is considered to be commercially unusable.

<sup>8</sup>Sold or used by producers.