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CLAY AND SHALE [ADVANCE RELEASE]

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CLAY AND SHALE

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The amount of clay sold or used by domestic producers in 2007 was 36.8 million metric tons (Mt) valued at $1.76 billion compared with 41.2 Mt valued at $1.77 billion in 2006 (table 1). Common clay and shale accounted for 56% of the tonnage, and kaolin accounted for 54% of the value (tables 1, 5, and 8). In 2007, exports were 5.65 Mt valued at $928 million compared with 5.98 Mt valued at $1.0 billion in 2006. Imports of clays were 231,000 metric tons (t) valued at $73.9 million in 2007 compared with 346,000 t valued at $79.2 million in 2006 (table 1).

Major markets, in decreasing order by tonnage, for ball clay were floor and wall tile (38%), sanitaryware (24%), and pottery and miscellaneous ceramics (9%); for bentonite, absorbents (26%), drilling mud (23%), foundry sand bond (17%), and iron ore pelletizing (14%); for common clay and shale, brick (57%), portland cement (19%), and lightweight aggregate (14%); for fire clay, heavy clay products and lightweight aggregate (58%) and refractory and miscellaneous products (42%); for fuller's earth, absorbents (66%); and for kaolin, paper coating and filling (62%). Data that were concealed on tables 3-7 and 11 were included when calculating the percentages.

Legislation and Government Programs

The U.S. Court of Appeals for the District of Columbia Circuit ruled against the U.S. Environmental Protection Agency's maximum achievable control technology (MACT) for hazardous air pollutants for the brick, clay ceramic, and structural clay kilns. The court ruled that standards set by MACT violated the Clean Air Act (U.S. Court of Appeals, 2007).

Production

Domestic production data for clays were developed by the USGS from a voluntary survey of U.S. operations. Responses to the survey and company production data available from other sources accounted for approximately 55% of the total clay and shale tonnage sold or used quantity listed in table 1. Most nonrespondents were producers of common clay and shale. Production data for the nonrespondents were estimated from reported prior-year production levels adjusted by trends in the industry, employment hours, and other guidelines.

About 190 companies mined clay and shale in the United States in 2007. The 20 leading companies, many with multiple operations, accounted for 50% of the tonnage and 80% of the value for all types of clay produced and sold or used. Clay production was reported in all States except Alaska, Delaware, Hawaii, Idaho, New Hampshire, Rhode Island, Vermont, and Wisconsin (table 2). Companies not participating in the U.S. Geological Survey (USGS) canvass of the clay and shale industry probably mined clay for construction uses in States for which no production was reported.

The 10 leading producer States were, in decreasing order of tonnage, Georgia, Wyoming, Alabama, Texas, North Carolina, Ohio, South Carolina, Arkansas, Tennessee, and Virginia. The 10 leading producer companies were, in alphabetical order, American Colloid Co. (bentonite); Engelhard Corp. (bentonite, fuller's earth, and kaolin); General Shale Products Corp. (common clay and shale); Glen Gery Corp. (common clay and shale); Imerys SA (ball clay and kaolin); KaMin LLC (formerly J.M. Huber Corp., kaolin); Nestle Purina Petcare Co. (fuller's earth); Oil-Dri Corp. (fuller's earth); Thiele Kaolin Co. (kaolin); and Unimin Corp. (ball clay and kaolin).

Most clay mining in the United States was by open pit methods; less than 1% of U.S. clay output was from underground mines. All underground production was in Ohio, where the clays are mainly underclays associated with coal.

Ball Clay.—In 2007, four companies mined ball clay in four States. Production of domestic ball clay was 1.07 Mt valued at $49 million compared with 1.19 Mt valued at $53.1 million in 2006 (table 3). Operations in Tennessee supplied 63% of the production, followed by, in descending order of tonnage, Texas, Mississippi, and Kentucky. One producer reported a small amount of production in Indiana, but this probably was fire clay rather than ball clay.

Bentonite.—In 2007, 20 companies produced bentonite in 11 States. About 4.82 Mt valued at $252 million was sold or used compared with 4.94 Mt valued at $236 million of bentonite sold or used in 2006 (table 4). Production of nonswelling bentonite decreased to 219,000 t valued at $11.1 million in 2007 from 260,000 t valued at $11.8 million in 2006. Alabama led in the production of nonswelling bentonite, followed by, in descending order of tonnage, Mississippi, Arizona, California, and Colorado.

Production of swelling bentonite was 4.6 Mt valued at $241 million in 2007, a decrease from 4.68 Mt valued at $223 million in 2006. Wyoming led in the production of swelling bentonite, followed by Montana, Utah, Texas, California, Oregon, Nevada, and Colorado.

Common Clay and Shale.—In 2007, 142 companies produced common clay and shale in 41 States and Puerto Rico. In States not reporting production, common clay and shale probably was mined and sold for construction uses by companies not participating in the USGS canvass of the clay and shale industry.

Domestic sales or use of common clay and shale decreased to 20.6 Mt valued at $216 million in 2007 compared with 24.2 Mt valued at $243 million in 2006 (table 5). The major producing States were, in descending order of tonnage, Alabama, Texas,

North Carolina, Georgia, Ohio, Arkansas, Oklahoma, South Carolina, Virginia, and New York.

Fire Clay.—Fire clay producers were mostly refractory product manufacturers that used the clays in firebrick and various heavy clay products. In 2007, six firms mined fire clay in four States. Fire clay sold or used by domestic producers decreased to 565,000 t valued at $23.8 million from 848,000 t valued at $19.0 million in 2006 (table 6). California was the leading producing State, followed by, in descending order of tonnage, Missouri, Ohio, and South Carolina. The unit value is greater in 2007 than 2006 because four companies that sold or used fire clay for low-value common clay applications did not report fire clay production in 2007.

Fuller's Earth.—In 2007, 15 companies produced fuller's earth in 10 States. Fuller's earth deposits grade from palygorskite (attapulgite) in Florida to montmorillonite, further northward in Georgia. Gellant grades of attapulgite, used as thickeners in such items as drilling muds and paints, are in western Florida and southwestern Georgia. Absorbent grades of attapulgite are further north in Georgia. Absorbent grades of attapulgite are grouped with the montmorillonite variety of fuller's earth in table 7 to be consistent with past reporting.

Gellant-grade attapulgite was mined or sold in the Florida Panhandle and southwestern Georgia by three companies. Attapulgite production decreased to 245,000 t valued at $36.5 million in 2007 compared with 285,000 t valued at $42.2 million in 2006 (table 7). Georgia led in the production of attapulgite, followed by Florida. Sepiolite, although not a fuller's earth, was mined in Nevada and included in the total for gellant-grade attapulgite to avoid disclosing company proprietary data.

Production of the montmorillonite variety of fuller's earth increased to 2.41 Mt valued at $221 million in 2007 compared with 2.26 Mt valued at $201 million in 2006 (table 7). Montmorillonite-type fuller's earth was produced, in decreasing order of tonnage, in Georgia, Missouri, Mississippi, Virginia, California, Illinois, Florida, Tennessee, Kansas, and Texas. Production increased in most States with the greatest increase being in Mississippi.

General Chemical Industrial Products, Inc. (a subsidiary of Tata Sons, Ltd.) announced the purchase of Attapulgite Mining LLC from Zemex Corp. Attapulgite Mining operated a mine near Attapulgus, GA (Tata Sons, Ltd., 2007).

Kaolin.—In 2007, 17 firms mined kaolin in 9 States. Domestic production was 7.11 Mt valued at $959 million compared with 7.47 Mt valued at $981 million in 2006 (table 8). Declines were spread across several markets, although the largest losses were in paper coating, paper filler, and refractory application markets. The leading producer State was Georgia, followed by, in descending order of tonnage, South Carolina, Alabama, Arkansas, Nevada, Texas, California, Florida, and North Carolina.

Of the 7.11 Mt sold or used in 2007, 3.26 Mt was reported as water washed, 1.39 Mt was calcined, 1.14 Mt was delaminated, 1.18 Mt was airfloat, and 135,000 t was unprocessed (table 8). This compares with 3.61 Mt of water washed, 1.27 Mt of calcined, 1.24 Mt of delaminated, 1.21 Mt of airfloat, and 141,000 t of unprocessed in 2006. Of the calcined kaolin, 903,000 t was pigment-grade (low-temperature calcined kaolin). Companies in Georgia accounted for nearly all the pigment-grade calcined kaolin produced in 2007. A small amount also was produced in Texas. The remainder was refractory-grade (high-temperature calcined kaolin).

Kaolin production in Georgia was reported to be 6.57 Mt valued at $924 million in 2007 compared with 6.92 Mt valued at $945 million in 2006. Approximately 3.19 Mt of Georgia kaolin production was reported as sold as water washed, 1.14 Mt was delaminated, 1.29 Mt was calcined (high- and low-temperature calcined kaolin), and 948,000 t was airfloat in 2007. This compares with 3.53 Mt water washed, 1.24 Mt delaminated, 1.18 Mt calcined, and 966,000 t airfloat in 2006 (table 9). Production in South Carolina was 297,000 t valued at $17.6 million in 2007 compared with 294,000 t valued at $17.9 million in 2006 (table 10).

Imerys announced that it had signed an agreement to purchase The Feldspar Corp. from Zemex. Feldspar has a kaolin operation in Florida and feldspar operations in Georgia and North Carolina. The company had sales of more than $30 million, mainly for ceramics applications (Imerys SA, 2007c).

Harvest Partners, LLC announced an agreement to sell U.S. Silica Co. to Harbinger Capital Partners Master Fund I, Ltd. and Harbinger Capital Partners Special Situations Fund, L.P. U.S. Silica produced calcined kaolin as well as aplite and silica from operations in 13 States (Harvest Partners, LLC, 2007).

Consumption

Ball Clay.—Ball clay sold or used in 2007, including exports, was 1.07 Mt, a decrease from 1.19 Mt in 2006. The principal domestic ball clay markets were, in decreasing order by tonnage, floor and wall tile and sanitaryware (table 3). Other uses for ball clay, in decreasing order by tonnage, were miscellaneous ceramics; unknown applications; miscellaneous fillers, extenders, and binders; fiberglass; electric porcelain; roofing granules; catalysts; pottery; fine china; firebrick; miscellaneous refractory products; animal feed; rubber; and brick. Sales to markets such as animal feed, catalysts, fiberglass, and rubber may also include kaolin mined by the ball clay producers.

Bentonite.—Domestic sales and use were 3.96 Mt and total sales (domestic and export) in 2007 were 4.82 Mt compared with domestic sales of 4.12 Mt and total sales of 4.94 Mt in 2006 (table 4). Major domestic markets for bentonite were, in decreasing order by tonnage, pet waste absorbent, drilling mud, iron ore pelletizing, and foundry sand. Total sales (domestic and exports) of bentonite were approximately 808,000 t for foundry sand bond (more than 95% was swelling bentonite), 1.26 Mt for pet waste absorbent (all swelling bentonite), 1.12 Mt for drilling mud (all swelling bentonite), and 747,000 t for pelletizing iron ore (all swelling bentonite). Sales of bentonite for pet waste absorbents, drilling mud, and iron ore pelletizing remained strong in 2007. Sales for foundry sand bond applications declined as demand from heavy industry slowed in the United States. Other markets for bentonite were, in decreasing order by tonnage, miscellaneous civil engineering and sealing; waterproofing and sealing; water treatment and filtering; animal feed; oil and grease absorbents; unknown exports; paint; unknown domestic uses; miscellaneous fillers,

extenders, and binders; miscellaneous chemical manufacturing; adhesives; cosmetic, medical, and pharmaceutical; filtering, clarifying, and decolorizing minerals, oils and greases; fertilizer carrier; pesticide carrier; miscellaneous refractory products; and miscellaneous ceramics.

The major domestic markets for swelling bentonite were, in decreasing order, pet waste absorbents, drilling mud, foundry sand, iron ore pelletizing, civil engineering and sealing, waterproofing and sealing, and water treatment. Major export markets for swelling bentonite were, in decreasing order, foundry sand, pet waste absorbent, drilling mud, and iron ore pelletizing. The major domestic use for nonswelling bentonite was in water treatment and filtering.

For the smaller markets, swelling bentonite accounted for more than 95% of the bentonite sold for adhesives, animal feed, civil engineering, cosmetics, fertilizers, miscellaneous chemical manufacture applications, medical, oil and grease absorbents, paint, and waterproofing but less than 30% of the bentonite sold for water treatment and filtering.

Common Clay and Shale.—Consumption of common clay and shale decreased to 20.6 Mt from 24.2 Mt in 2006. Brick manufacture remained the leading market for common clay and shale, followed by, in descending order of tonnage, lightweight aggregate and portland cement (table 5). Other markets, in descending order of tonnage, were refractory mortar and cement, refractory fire brick, ceramic floor tile, roofing granules, pottery, flue linings, drain tile, flower pots, sewer pipe, and refractory grogs and calcines.

Sales of common clay and shale declined by 15% in response to reduced demand by the commercial and residential building industries. Residential and nonresidential construction, on which the common clay and shale industry is dependent, decreased in value to $1.16 trillion in 2007 from $1.19 trillion in 2006 (U.S. Census Bureau, 2008a).

Fire Clay.—Consumption of fire clay decreased to 565,000 t in 2007 from 848,000 t in 2006. Sales decreased mainly because four companies that sold or used fire clay for low-value common clay applications did not report fire clay production in 2007. Additionally, there was reduced demand from the construction industry for heavy clay products manufactured using fire clay (table 6). Fire clays were used in grogs and calcines; high-alumina brick and specialties; ramming and gunning mixes; refractory products, such as firebrick and block; mixes and mortars; and saggers. Fire clays also were used to produce such items as brick and pottery. Markets for fire clay were, in descending order of tonnage, lightweight aggregate, portland cement, floor and wall tile, refractory mortar and cement, common brick applications, and refractory calcines and grogs.

Fuller's Earth.—Consumption of fuller's earth was 2.66 Mt in 2007 compared with 2.54 Mt in 2006. Pet waste absorbent was the leading market for fuller's earth, followed by miscellaneous applications, oil and grease absorbents, and miscellaneous filler and extender uses (table 7).

Domestic markets for montmorillonite-type fuller's earth were, in descending order of tonnage, pet waste absorbents; oil and grease absorbents; civil engineering and sealing; miscellaneous absorbents; pesticide carrier; miscellaneous fillers, extenders, and binders; clarifying, decolorizing, and filtering of oils and greases; unknown uses; and animal feed. The first three applications accounted for more than 50% of sales of montmorillonite-type fuller's earth. The leading export market was drilling mud.

Domestic markets for attapulgite-type fuller's earth were, in decreasing order, miscellaneous filler and extender applications; drilling mud; miscellaneous absorbents; fertilizer carrier; oil and grease absorbents; paint; animal feed; clarifying, decolorizing, and filtering of mineral oils and greases; cosmetic, medical, and pharmaceutical applications; and desiccant. The first three applications accounted for more than 65% of sales of attapulgite. The major export market was drilling mud.

Montmorillonite grades accounted for more than 80% of sales of fuller's earth for animal feed; clarifying, decolorizing, and filtering of oils and greases; miscellaneous civil engineering; oil and grease absorbents; pesticide carriers; pet waste absorbents; and exported products. Attapulgite accounted for most of the sales for cosmetic, medical, and pharmaceutical applications; drilling mud; fertilizer carriers; and paint.

Kaolin.—Consumption of kaolin decreased to 7.11 Mt in 2007 from 7.47 Mt in 2006 (table 8). The major domestic markets for kaolin were, in descending order of tonnage, paper coating and filling, refractory products, fiberglass, paint, catalyst manufacture, rubber, and heavy clay products (including portland cement). Major export markets were paper coating and filling and paint (table 11). Use in adhesives, catalysts, plastics, and refractory applications increased in 2007. Paper coating and filling markets accounted for 59% of the decline in kaolin sales in 2007. Construction-related markets such as fiberglass, paint, and sanitaryware also declined in 2007 in response to weak housing markets.

Sales of kaolin from Georgia were 6.57 Mt in 2007 compared with 6.92 Mt in 2006. Major domestic markets for kaolin from Georgia were, in descending order by tonnage, paper coating and filling, refractory products, fiberglass, paint, rubber, and catalyst manufacture. The major export market for Georgia kaolin was in paper applications (table 9). Sales of kaolin from South Carolina were 297,000 t in 2007 compared with 294,000 t in 2006 (table 10). Major domestic markets for kaolin from South Carolina were, in descending order of tonnage, rubber, brick, catalyst, fiberglass, plastics, adhesives, portland cement, paper, roofing granules, sanitaryware, firebrick, pottery, and animal feed. The major export market for kaolin from South Carolina was rubber applications.

Uses.—By application, consumption of clays was as follows:

Absorbent Uses.—Sales reported by producers for absorbent uses were 3.22 Mt in 2007 compared with 3.07 Mt in 2006. Sales of bentonite for absorbents were almost unchanged from 2006, and sales of fuller's earth for absorbents increased in 2007.

Fuller's earth accounted for 58% of the clay used for absorbents, followed by bentonite and a small amount of kaolin. Pet waste absorbents accounted for 82% of absorbent consumption, followed by oil and grease absorbents (14%), and miscellaneous absorbent applications (4%). Fuller's earth was the predominant clay used for oil and grease absorbent applications. Fuller's earth accounted for 57% of pet waste absorbent sales and bentonite accounted for 43%.

Ceramics.—All varieties of clays were used in ceramics. Demand for clay in the manufacture of ceramics, ranging from china to sanitaryware to roofing granules, was 2.12 Mt in 2007 compared with 2.29 Mt in 2006. The leading ceramics markets were ceramic floor and wall tile (36%), miscellaneous ceramics (16%), sanitaryware (13%), roofing granules (13%), catalyst (12%), pottery (9%), electrical porcelain (1%), and fine china (1%). Ball clay accounted for 41% of the clay used in ceramics; common clay and shale, 29%; and kaolin, 26%. Small amounts of bentonite and fire clay also were used in the manufacture of ceramics. Ball clay dominated the electrical porcelain and sanitaryware markets. Common clay and shale was the predominant category of clay used in pottery and roofing granules. Kaolin dominated the catalyst market. Ball clay and common clay and shale were the predominant clays used in floor and wall tile manufacture, and ball clay and kaolin dominated the fine china market.

In 2007, apparent consumption of clay floor and wall tile in the United States was 157 million square meters valued at $1.83 billion compared with 308 million square meters valued at $3.17 billion in 2006. Domestic producers shipped 50.6 million square meters of clay floor and wall tile in 2007 compared with 58.5 million square meters in 2006. In 2007, exports were 4.41 million square meters valued at $41.9 million compared with 4.19 million square meters valued at $37.3 million in 2006. Imports of clay floor and wall tile were 111 million square meters valued at $1.07 billion in 2007, compared with 254 million square meters valued at $2.37 billion in 2006 (U.S. Census Bureau, 2008b, p. 12). The 49% decline in apparent consumption of clay floor and wall tile and 56% decline in imports occurred primarily in response to a large drop in housing construction in 2007.

The U.S. International Trade Commission (2008) reported that 19.7 million square meters valued at $150 million of glazed and unglazed ceramic tile with sides measuring less than 7 centimeters was imported in 2007 compared with 31.5 million square meters valued at $226 million in 2006. Brazil, China, Italy, and Spain were the major sources of imported tile of these dimensions.

Imports of ceramic baths, bidets, flush tanks, lavatories, sinks, toilet bowls, and other ceramic sanitary fixtures decreased in 2007. The U.S. International Trade Commission (2008) reported imports to be 34.0 million units compared with 36.2 million units in 2006. China and Mexico were the major sources of imported sanitaryware, supplying 71% of the units imported into the United States.

Construction.—Common clays and shales were used to manufacture a wide variety of construction materials, including expanded aggregates, hydraulic cement, and structural clay products.

Expanded Clay and Shale.—Approximately 3.93 Mt of clay and shale was used in the production of lightweight aggregates in 2007 compared with 4.05 Mt in 2006 (table 12). More than 99% of clay used to manufacture lightweight aggregates was common clay and shale. A small amount of fire clay also was used. Lightweight aggregates were used in concrete block, structural concrete, and highway surfacing, in decreasing order of tons consumed.

Hydraulic Cement.—Clays provide the alumina and silica required to manufacture hydraulic cements. In 2007, approximately 3.25 Mt of clays was consumed in the production of cement compared with 4.69 Mt in 2006. Reduced construction activity in 2007 caused the large decline in sales for cement manufacture. In descending order of tonnage, common clay and shale, fire clay, and kaolin were used in the manufacture of portland cement clinker. About 94% of the clay consumed by the cement industry was common clay and shale.

Structural Clay Products.—Approximately 12.2 Mt of clays was used in the manufacture of structural clay products, such as building brick, roofing tile, and sewer pipe compared with 14.5 Mt in 2006. Common and face brick accounted for about 98% of this total. Other markets were, in descending order of tonnage, flue linings, miscellaneous clay products, drain tile, flower pots, and sewer pipe. About 99% of the clay used to manufacture structural clay products was common clay and shale. Small amounts of ball clay, fire clay, and kaolin also were used.

In 2007, domestic producers shipped 7.12 billion building and face bricks compared with 8.90 billion bricks in 2006. About 114,000 t of vitrified clay sewer pipe and fittings valued at $57.1 million was shipped in 2007 compared with 152,000 t valued at $77.7 million in 2006 (U.S. Census Bureau, 2008b, p. 2).

Drilling Mud.—Sales of clays for drilling mud applications were 967,000 t for domestic use and 209,000 t exported compared with 1.08 Mt and 126,800 t in 2006, respectively. Swelling-type bentonite accounted for 95% of the clay used in drilling mud. Fuller's earth also was used in drilling mud applications. Exports of drilling mud increased in 2007 as the result of increased oil drilling activity worldwide (3,116 rotary rigs in 2007 and 3,043 in 2006). The average number of rotary rigs in Canada and the United States operating in 2007 declined slightly to 2,110 compared with 2,120 in 2006 (Baker Hughes Inc., 2008).

Fillers, Extenders, and Binders.—Clays are used as fillers, extenders, and binders in a wide variety of products, such as adhesives, flooring products, paint, paper, and rubber. About 4.10 Mt of clays was sold for use as fillers, extenders, and binders in the United States compared with 4.35 Mt in 2006. An additional 2.02 Mt of clays was exported for filler and extender applications in 2007 compared with 1.93 Mt in 2006. Paper coating and filling accounted for 64% of domestic sales, followed by paint (10%), miscellaneous filler and extenders (9%), rubber (6%), animal feed (4%), and pesticide carriers (3%). Adhesives; cosmetic, medical, and pharmaceutical; fertilizer carrier; and plastics each accounted for less than 2% of the domestic fillers and extenders markets. Decreased sales to paper coating and filling markets in 2007 accounted for most of the decline in sales to fillers, extenders, and binder markets.

Kaolin accounted for approximately 88% of the clay used in domestic and export filler and extender applications, followed by fuller's earth (5%), bentonite (4%), common clay and shale (3%), and ball clay (less than 1%). Bentonite was the predominant clay used for animal feed and cosmetic, medical, and pharmaceutical applications; fuller's earth dominated in fertilizer and pesticide applications. Kaolin was the predominant clay used for adhesives, paint, paper, plastics, and rubber markets.

The U.S. Census Bureau (2007c) reported shipments of paint and coatings for 2007 to be 5.80 billion liters (1.50 billion gallons) compared with 5.94 billion liters (1.55 billion gallons) in 2006. Of this amount, architectural paints, the major market for paint-grade fillers, was 2.83 billion liters (748 million gallons) in 2007 compared with 2.88 billion liters (761 million gallons) in 2006.

Fiberglass.—Sales of clays, including exports, to the fiberglass and mineral wool industry were 362,000 t in 2007 compared with 402,000 t in 2006. Most of the clay used for fiberglass was kaolin. About 3.28 Mt of fiberglass was sold in 2007 compared with 3.27 Mt in 2006 (Freedonia Group, Inc., The, 2007, p. 50).

Iron Ore Pelletizing.—Sales of clays for iron ore pelletizing applications reported by producers were 747,000 t (677,000 t used domestically and 70,000 t exported) in 2007 compared with 733,000 t in 2006. Sales were relatively unchanged in 2007 in response to strong iron and steel demand worldwide in 2007. Swelling bentonite was the only type of clay used for this application.

Paper Products.—Total sales for paper declined to 4.40 Mt in 2007 from 4.61 Mt in 2006. Kaolin accounted for all the clay sales used for paper coating (2.31 Mt sold domestically and 1.64 Mt exported), and essentially all the clay used for paper filling (329,000 t sold domestically and 122,000 t exported).

Refractory Products.—Producers reported that 2.21 Mt of clays was used for the manufacture of refractory products in 2007 (1.41 Mt with foundry sand excluded) compared with 2.38 Mt in 2006 (1.44 Mt with foundry sand excluded). Foundry sand accounted for 29% of domestic sales and all export sales under the refractory category. Other refractory markets for clays were firebrick; grogs and calcines; high-alumina brick and kiln furniture; and refractory mortar and cement. About 246,000 t was exported for refractory applications. Foundry sand accounted for 78% of the decline in sales for refractory products in 2007.

Bentonite accounted for 808,000 t of refractory sales (562,000 t domestic and 246,000 t exported), followed by common clay and shale (739,000 t), kaolin (502,000 t), fire clay (data withheld), and ball clay (data withheld).

The U.S. Census Bureau (2007e) reported that apparent consumption of clay refractory products was $913 million in 2007 compared with $907 million in 2006. Clay refractory shipments were valued at $958 million in 2007 compared with $963 million in 2006. Shipments of unshaped clay refractory bonding mortars were 652,000 t valued at $410 million compared with 872,000 t valued at $411 million in 2006. Unshaped clay refractory products were followed by fireclay, high alumina, and insulating brick shapes (479,000 t valued at $514 million in 2007 compared with 531,000 t valued at $519 million in 2006). The remainder was other refractory clay raw materials and refractory materials sold in lump or ground form.

Prices

The major producers of kaolin announced price increases for their ball clay and kaolin products. These increases ranged from 3% to 12%, depending on the product. The price increases were in addition to energy surcharges that also were imposed during 2007.

Ball Clay.—The average value for ball clay reported by domestic producers was $45.71 per metric ton. The average value for exported ball clay was $68 per ton.

Bentonite.—The average value reported by domestic producers for nonswelling bentonite was $50.68 per ton. The average value for swelling bentonite was $52.39 per ton. The average value for all bentonite was $52.28 per ton. The average value of exported bentonite was $110 per ton. The average value of imported bentonite was $217 per ton.

The price, ex-works, Wyoming, crude, bulk, railcars, was $36 to $82 per ton; foundry-grade, bagged, railcars, $55 to $80 per ton; and American Petroleum Institute (API)-grade, bagged, railcars, $55 to $80 per ton. The price for bentonite, India, crushed, dried, loose in bulk, was $43 to $53 per ton for API-grade; $32 to $40 per ton for pet litter grade; and $59 to $76 per ton for foundry grade (Industrial Minerals, 2007c).

Common Clay and Shale.—The average value for all common clay and shale produced in the United States was $10.50 per ton. The unit value of clay and shale used to produce lightweight aggregate was $26.72 per ton. Average prices for lightweight aggregate produced from clay and shale ranged from $30 to $70 per ton for most applications.

Fire Clay.—The average value for fire clay reported by domestic producers was $42.16 per ton. The average value increased from $22.41 because a smaller amount of fire clay was sold for low-value heavy clay applications in 2007 than was sold in 2006. The average value of exported fire clay was $112 per ton. The average value of imported fire clay was $292 per ton.

Fuller's Earth.—The average value of attapulgite-type fuller's earth was $148.98 in 2007. The average value of montmorillonite-type fuller's earth was $91.70 per ton. The average value for all fuller's earth was $96.89 per ton. The average value of exported fuller's earth was $281 per ton.

Kaolin.—The average value of kaolin was $134.97 per ton for all kaolin grades. The average value for airfloat was $72.54 per ton; refractory-grade (high-temperature calcined), $38.55 per ton; pigment-grade (low-temperature calcined), $289.04 per ton; all types of calcined, $201.44 per ton; delaminated, $131.58 per ton; unprocessed, $14.59 per ton; and water washed, $135.58 per ton. The average value of exported kaolin was $186 per ton. The average value of the imported kaolin was $250 per ton.

The price, ex-works, Georgia, filler, bulk, was $80 to $100 per ton; coating, bulk, $85 to $185 per ton; sanitaryware-grade, bagged, $65 to $75 per ton; tableware-grade, bagged, $125 per ton; and calcined, bulk, $320 to $375 per ton (Industrial Minerals, 2007c).

Foreign Trade

Ball Clay.—Ball clay exports were 83,200 t valued at $5.61 million in 2007 compared with 140,000 t valued at $7.89 million in 2006, according to the U.S. Census Bureau (table 14). Producers reported exports of 247,000 t. Most of the extra tonnage reported by ball clay producers was likely accounted for by shipments to Mexico. Exports to Mexico reported by the U.S. Census Bureau typically are significantly less than indicated by

ball clay producers. The water weight of slurry shipments (about 30% to 35% of the shipment weight) may also account for a portion of the extra tonnage reported by producers. No imports were reported in 2007 (table 15).

Bentonite.—Bentonite exports increased to 1.43 Mt valued at $158 million in 2007 from 1.27 Mt valued at $132 million in 2006 (table 14). Exports increased to Canada and the Netherlands and decreased to Japan. Changes in trade with other countries were relatively minor. Domestic bentonite producers reported exports of 854,000 t (table 4). The large discrepancy between data reported by producers and the U.S. Census Bureau resulted from producers including most of the exports destined for Canadian and Mexican markets (542,000 t) under domestic sales. In addition, some bentonite is packaged domestically and then exported as a finished product, such as cat litter. Sales through U.S. mineral brokers, where producers do not know if the bentonite is used domestically or exported, could also explain part of the discrepancy.

Bentonite imports consisted mainly of untreated bentonite clay and chemically or artificially activated materials. Imports of untreated bentonite were 11,000 t valued at $2.39 million. Imports of chemically activated material were 23,000 t valued at $22.4 million (table 15).

Fire Clay.—In 2007, exports increased to 425,000 t valued at $47.7 million compared with 348,000 t valued at $38.1 million in 2006 (table 14). At least 63% of the exports reported by the U.S. Census Bureau under the Harmonized Tariff Schedule of the United States code for fire clay was thought to be refractory-grade kaolin rather than fire clay based on the locations of ports from which the material was exported. Imports were 2,370 t valued at $584,000 (table 15).

Fuller's Earth.—In 2007, exports increased to 134,000 t valued at $37.7 million compared with 69,000 t valued at $16.4 million in 2006 (table 14). Belgium, China, and Japan accounted for more than 75% of the increase in exports. Imports of decolorizing earth and fuller's earth were not reported in 2007 (table 15).

Kaolin.—In 2007, 3.30 Mt of kaolin valued at $615 million was exported compared with 3.54 Mt valued at $626 million in 2006 (table 14). Producers reported exports of 1.98 Mt (table 11). Much of the 460,000 t destined for Canada and 352,000 t for Mexico probably was reported under domestic consumption. Sales through U.S. mineral brokers, where producers do not know if the kaolin is used domestically or exported, also could explain part of the discrepancy.

Kaolin imports decreased to 194,000 t valued at $48.5 million in 2007 compared with 303,000 t valued at $55.6 million in 2006 (table 15). About 95% of the kaolin was imported from Brazil followed by the United Kingdom. Imports from Brazil were primarily for paper coating applications, and those from the United Kingdom were primarily for paper filler applications.

World Review

World production of bentonite was approximately 12.0 Mt (table 16). Fuller's earth production was 3.89 Mt (table 17). Kaolin production was about 39.0 Mt (table 18); this includes ball clay from Australia and crude kaolin ore production tonnages from many other countries. World sales of processed kaolin were estimated to be between 25 and 26 Mt, after excluding 4 Mt for Uzbekistan, 3.4 Mt for the Czech Republic, 3.1 Mt for Germany, 2.2 Mt for the Republic of Korea, 350,000 t for Mexico, 200,000 t for Egypt, 100,000 t for Australia, and 100,000 t for Iran, to account for processing losses. The United States continued to be the leading supplier of processed clay for sale, followed by Greece, Turkey, and the Commonwealth of Independent States for bentonite; Spain for fuller's earth; and the United Kingdom and Brazil for kaolin. Spain led all countries in the production of sepiolite.

Azerbaijan.—AzRosPromivets (a joint venture between Azerbaijan Dash Salhali Bentonite Refinery and Russia Bentonite Scientific Production Unit) announced a planned expansion of bentonite production in Qazakh. The operation produced activated bentonite and bentonite for foundry sand bond, clarifying of wines, and drilling muds. About $12 million was invested in the initial stage of construction; about $20 million will have been invested by the time construction is completed in 2008. The company anticipated mining about 7 Mt during the next 25 years. Bentonite reserves were estimated to be 83 Mt (APA Economics, 2007).

Belgium.—Ashapura Minechem formed a joint venture with Amcol International Corp. to build a plant in Antwerp to process bentonite, bleaching clay, and kaolin imported from India. The plant was to have been commissioned in December 2007 (Ashapura Group, 2007).

Canada.—Whitemud Resources Inc. continued construction of its metakaolin plant near Wood Mountain, Saskatchewan. The company planned to process kaolin from its Gollier Creek Mine to manufacture a high-reactivity metakaolin for use in cement for construction and oil and gas well applications. Whitemud anticipated completion of the mill in 2008 (Whitemud Resources Inc., 2007).

Northwest Pozzolan Ltd. (a subsidiary of Hillsborough Resources Ltd.) was established to produce metakoalin from the tailings of an underground coal mining operated by Hillsborough Resources on Vancouver Island, British Columbia. The metakaolin was expected to be sold for cement applications (Industrial Minerals, 2007a).

France.—Imerys announced that it will invest $146 million (€100 million) on its brick production facilities in France. Production capacity was scheduled to be increased at its Gironde and Loire Atlantique facilities and new facilities were planned for construction in southeastern and northern France. The brick market in France was expected to increase by at least 5% annually for the next 5 years (Imerys SA, 2007b).

Germany.—S&B Industrial Minerals S.A. agreed to purchase a bentonite processing plant from OMYA GmbH for $5.85 million (€4 million). The plant has a capacity of 50,000 tons per year (t/yr) and is located in the port city of Neuss on the Rhine River. S&B planned to use the plant to process white bentonite for such uses as ceramics, detergents, food, paint, and paper and pulp production (S&B Industrial Minerals S.A, 2007a).

Rockwood Clay Additives GmbH acquired the clay additives division of Süd-Chemie AG. The division supplied nanoclay products for the manufacture of high-performance plastic components (Rockwood Holdings Inc., 2007).

Italy.—Wienerberger AG acquired RIL Lateriza Srl for $15.2 million (€10.4 million). RIL owned a 140-million-brick-per-year hollow brick plant in Gattinara. The purchase would give Wienerberger better access to brick markets in northern Italy (Wienerberger AG, 2007).

Morocco.—S&B Industrial Minerals announced plans to construct a 150,000-t/yr plant to process white bentonite in the Nador region by the end of 2008. The plant was expected to be operated as S&B Industrial Minerals Morocco S.A.R.L. Product from the new plant would be shipped to another S&B facility in Neuss, Germany, for additional processing. Bentonite will be provided by another of S&B's subsidiary, North African Industrial Minerals Exploration S.A.R.L. (NAIMEX). NAIMEX operates a mine near Trebia (S&B Industrial Minerals S.A, 2007b).

Turkey.—Amcol International acquired Bensan Aktiflestirilmis Bentonit Sanayi ve Ticaret AS for $12.3 million. Bensan owned mines in the Enez Edime region with reserves of 15 Mt. The company produced bentonite for bleaching edible oils, desiccants, detergents, drilling mud, and foundry sand bond applications. The purchase would allow Amcol better access to eastern European and Middle Eastern markets (Amcol International Corp., 2007).

Ukraine.—Imerys announced that it increased its ownership share in Vatutinsky Kombinat Vognetryviv (VKV) to 86% from 26%. VKV produces low- and medium-alumina content chamottes from its operations near Vatutine for refractory use. The mine produces about 1 million metric tons per year and the plant has a capacity of 480,000 t/yr. VKV serves markets in eastern Europe (Imerys SA, 2007a; Industrial Minerals, 2007b).

Outlook

In the United States, housing starts declined by 25% from those of 2006 for privately owned housing units. This is the second year of decline from the record set in 2005 (U.S. Census Bureau, 2008d). Defaults on existing mortgages and tightened credit for loans will probably continue to hamper growth in housing starts for 2008 and 2009. This may result in continued sales losses to construction-oriented markets for clay-based products such as adhesives, clay brick, drain tile, portland cement, ceramic tile, lightweight aggregate, paint, fiberglass, roofing granules, sanitaryware, and sewer pipe in 2008. As a result, sales of ball clay, common clay and shale, and kaolin for these construction-oriented applications may decline in 2008. Sales of fire clay for refractory products will probably remain unchanged through 2008, but use of fire clay for the manufacture of portland cement and heavy clay products may decline.

Absorbent markets, particularly pet waste absorbents, have been the mainstay for the bentonite and fuller's earth industries. Pet waste absorbent markets were not affected by the recent downturn in the housing and financial markets, much to the benefit of the bentonite and fuller's earth industries. This is expected to continue through 2008. Oil absorbent use may decline slightly because heavy industries have retracted in response to the downturn in the U.S. economy.

Drilling for oil continued at a high level worldwide so demand for bentonite and fuller's earth for drilling mud applications may remain unchanged for 2008. However, demand for drilling mud could decrease slightly in 2009 if oil prices continue to decline and the recent trend in 2008 for reduced world demand, caused by the worsening world economic situation, continues.

A slight slackening of demand for steel worldwide for construction and industrial manufacturing as a result of declining world economies may result in slightly decreased sales of bentonite for pelletizing iron ore and a decreased demand for bentonite and fuller's earth for foundry applications in 2008.

The leading markets for kaolin, paper coating and filling, continue to be affected by a slow paper industry in the United States and foreign competition in overseas markets. Sales for paper applications will probably continue to decline slightly during the next few years.

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TABLE 1
SALIENT U.S. CLAY STATISTICS[1, 2]

(Thousand metric tons and thousand dollars)

	2003	2004	2005	2006	2007
Domestic clays sold or used by producers:					
Quantity	40,000	41,200	41,200	41,200	36,800
Value	1,660,000	1,680,000	1,590,000	1,770,000	1,760,000
Exports:					
Quantity	5,130	5,630	5,620	5,980	5,650
Value	859,000	936,000	929,000	1,000,000	928,000
Imports for consumption:					
Quantity	279	251	301	346	231
Value	51,200	61,700	59,400	79,200	73,900

[1]Excludes Puerto Rico.
[2]Data are rounded to no more than three significant digits.

TABLE 2
CLAYS SOLD OR USED BY PRODUCERS IN THE
UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars)

State	2006		2007	
	Quantity	Value	Quantity	Value
Alabama	2,210 r	38,800 r	2,240	43,100
Arkansas	1,140 r	2,550 r	1,120	3,760
California	768 r	10,100 r	579	7,100
Colorado	211 r	1,340 r	174	1,100
Florida	285	27,300	24	2,770
Georgia	9,170	1,020,000	8,670	1,000,000
Illinois	227	700	W	W
Indiana	779 r	16,400 r	624	13,100
Iowa	356	2,750	331	2,630
Kansas	697 r	7,440 r	563	3,830
Kentucky	1,000 r	5,140 r	598	3,720
Louisiana	563	23,700	552	13,800
Maryland	286	851	173	412
Michigan	405	1,010	534	1,270
Mississippi	965 r	41,900 r	575	7,470
Missouri	1,110 r	11,800 r	426	4,370
Montana	W	W	W	W
Nevada	W	W	135	479
New Jersey	84	216 r	65	W
New York	813	30,400	699	28,500
North Carolina	2,370	25,100	1,740	19,900
Ohio	1,580 r	17,800 r	1,190	16,500
Oklahoma	1,180	4,700	1,050	4,060
Oregon	W	W	W	W
Pennsylvania	742	5,630	683	4,700
South Carolina	1,350	22,500	1,160	20,300
South Dakota	176	W	151	W
Tennessee	944 r	32,300 r	876	32,000
Texas	2,430 r	16,600 r	2,020	15,800
Utah	526 r	10,700 r	531	10,400
Virginia	762 r	1,810 r	725	6,360
West Virginia	W	W	W	W
Wyoming	4,420	209,000	4,310	227,000
Other[3]	3,660 r	187,000 r	4,260	263,000
Total	41,200	1,770,000	36,800	1,760,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Other."
[1]Excludes Puerto Rico.
[2]Data are rounded to no more than three significant digits; may not add to totals shown.
[3]Includes all other producer States and data represented by symbol W.

TABLE 3
BALL CLAY SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY TYPE AND USE[1]

(Thousand metric tons and thousand dollars)

	2006		2007	
	Quantity	Value	Quantity	Value
Type:				
Airfloat	909 r	40,100 r	780	34,800
Water-slurried	104 r	4,530 r	122	6,100
Unprocessed	181	8,490	169	8,100
Total	1,190	53,100 r	1,070	49,000
Use:				
Fillers, extenders, binders[2]	48 r	NA	47	NA
Floor and wall tile	470 r	NA	402	NA
Miscellaneous ceramics[3]	122 r	NA	95	NA
Pottery	22 r	NA	6	NA
Sanitaryware	285 r	NA	253	NA
Miscellaneous[4]	19 r	NA	21	NA
Exports[5]	228	NA	247	NA
Total	1,190	53,100	1,070	49,000

rRevised. NA Not available.

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

[2]Includes animal feed; asphalt emulsions (2006); rubber; and other fillers, extenders, and binders.

[3]Includes catalysts, electrical porcelain, fiberglass, fine china/dinnerware, glass, mineral wool, and roofing granules.

[4]Includes heavy clay products, waterproofing seals, refractories, and other unknown uses.

[5]Includes ceramics and glass and floor and wall tile.

TABLE 4
BENTONITE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY TYPE AND USE[1]

(Thousand metric tons and thousand dollars)

	2006		2007	
	Quantity	Value	Quantity	Value
Type:				
Nonswelling	260	11,800	219	11,100
Swelling	4,680	223,000	4,600	241,000
Total	4,940	236,000 r	4,820	252,000
Use:				
Domestic:				
Pet waste absorbents	1,060	NA	1,030	NA
Adhesives	6	NA	8	NA
Animal feed	110	NA	121	NA
Drilling mud	1,030	NA	912	NA
Filler and extender applications[2]	69	NA	83	NA
Foundry sand	672	NA	562	NA
Pelletizing (iron ore)[3]	662	NA	677	NA
Waterproofing and sealing	162	NA	139	NA
Miscellaneous civil engineering	313	NA	301	NA
Miscellaneous[4]	39 r	NA	128	NA
Total	4,120	NA	3,960	NA
Exports:				
Drilling mud	120	NA	204	NA
Foundry sand	267	NA	246	NA
Other[5]	433 r	NA	404	NA
Total	820 r	NA	854	NA
Grand total	4,940	236,000 r	4,820	252,000

rRevised. NA Not available.

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

[2]Includes asphalt tiles, asphalt emulsions, cosmetics, fertilizers, ink, medical, miscellaneous fillers and extenders applications, paint, paper coating, paper filling, pesticides and related products, pharmaceuticals, and plastics.

[3]Excludes shipments to Canada. Total sales in North America were 730,000 metric tons (t) in 2006 and 745,000 t in 2007.

[4]Includes ceramics, chemical manufacturing, clarifying and decolorizing, heavy clay products, oil and grease absorbents, refractories, and other unknown uses.

[5]Includes absorbents, fillers and extenders, refractories, pelletizing, and other unknown uses.

TABLE 5
COMMON CLAY AND SHALE SOLD OR USED BY PRODUCERS
IN THE UNITED STATES, BY STATE AND USE[1, 2]

(Thousand metric tons and thousand dollars)

	2006		2007	
	Quantity	Value	Quantity	Value
State:				
Alabama	2,210	38,800	2,240	43,100
Arkansas	1,140	2,550	1,120	3,760
California	744	7,640	549	4,010
Georgia	1,510	9,150	1,350	8,110
Indiana	779	16,400	624	13,100
Kansas	697	7,440	563	3,830
Kentucky	1,000	5,140	598	3,720
Louisiana	563	23,700	552	13,800
Mississippi	549	3,100	508	2,860
Missouri	750	4,160	426	4,370
New York	813	30,400	699	28,500
North Carolina	2,340	24,200	1,720	19,100
Ohio	1,580	17,800	1,190	16,500
Oklahoma	1,180	4,700	1,050	4,060
Pennsylvania	742	5,630	683	4,700
South Carolina	992	4,250	826	2,610
Texas	2,360	12,600	1,950	12,100
Utah	526	10,700	531	10,400
Virginia	762	1,810	725	6,360
Other[3]	2,960	13,100	2,660	11,500
Total	24,200	243,000	20,600	216,000
Use:				
Floor and wall tile[4]	249	NA	224	NA
Heavy clay products:				
Brick, extruded	12,200	NA	10,300	NA
Brick, other	1,610	NA	1,470	NA
Other[5]	266	NA	274	NA
Lightweight aggregate:				
Concrete block	2,040	NA	2,150	NA
Highway surfacing	323	NA	326	NA
Structural concrete	927	NA	759	NA
Miscellaneous	762	NA	689	NA
Portland and other cements	4,230 r	NA	2,950	NA
Refractories[6]	788	NA	739	NA
Miscellaneous[7]	807 r	NA	693	NA
Total	24,200	243,000	20,600	216,000

rRevised. NA Not available.

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

[2]Excludes Puerto Rico.

[3]Includes all other States except Alaska, Delaware, Hawaii, Idaho, Nevada, New Hampshire, Rhode Island, Vermont, and Wisconsin.

[4]Includes ceramic tile, quarry tile, and miscellaneous floor and wall tiles.

[5]Includes drain tile, flower pots, flue linings, sewer pipe, structural tile, and miscellaneous clay products.

[6]Includes firebrick, blocks and shapes, mortar and cement, grogs and calcines, and miscellaneous refractories.

[7]Includes exports; miscellaneous civil engineering and sealings; miscellaneous fillers, extenders, and binders; pottery, roofing granules; and other unknown uses.

TABLE 6
FIRE CLAY SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE[1]

(Thousand metric tons and thousand dollars)

	2006		2007	
	Quantity	Value	Quantity	Value
Production	848	19,000	565	23,800
Use:				
Heavy clay products and lightweight aggregates[2]	609	NA	325	NA
Refractories:				
Firebrick, block, shapes	3	NA	--	NA
Grogs and calcines	140	NA	W	NA
Other refractories[3]	46	NA	W	NA
Miscellaneous[4]	50	NA	240	NA
Total	848	19,000	565	23,800

NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Miscellaneous."
-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes common brick, concrete block, portland cement, and structural concrete.
[3]Includes kiln furniture, mortar and cement, and miscellaneous refractories.
[4]Includes floor tile, wall tile, and other unknown uses.

TABLE 7
FULLER'S EARTH SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY TYPE AND USE[1]

(Thousand metric tons and thousand dollars)

	2006		2007	
	Quantity	Value	Quantity	Value
Type:				
Attapulgite[2]	285 [r]	42,200	245	36,500
Montmorillonite	2,260 [r]	201,000	2,410	221,000
Total	2,540	243,000	2,660	257,000
Use:				
Absorbents:				
Oil and grease absorbent	253	NA	367	NA
Pet waste absorbent	1,440	NA	1,390	NA
Animal feed	112	NA	48	NA
Fertilizers	W	NA	W	NA
Fillers, extenders, binders[3]	195 [r]	NA	233	NA
Filtering, clarifying, and decolorizing animal, mineral, and vegetable oils and greases	55	NA	73	NA
Miscellaneous[4]	442 [r]	NA	523	NA
Exports[5]	23	NA	22	NA
Total	2,540	243,000	2,660	257,000

[r]Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Miscellaneous."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Primarily gellant-grade fuller's earth. More information can be found in the "Fuller's Earth" portion of the production section of this report.
[3]Includes asphalt emulsions; medical, pharmaceuticals and cosmetics; paints; pesticides and related products; and unknown uses.
[4]Includes civil engineering, drilling mud, miscellaneous absorbents, and other unknown uses.
[5]Includes oil and grease absorbents (2006), pet waste absorbents (2006), drilling mud, paint (2007), and other unknown uses.

TABLE 8
KAOLIN SOLD OR USED BY PRODUCERS IN THE UNITED STATES,
BY STATE AND TYPE[1]

(Thousand metric tons and thousand dollars)

	2006		2007	
	Quantity	Value	Quantity	Value
State:				
Georgia	6,920	945,000	6,570	924,000
South Carolina	294	17,900	297	17,600
Other[2]	262 r	17,200 r	244	17,300
Total	7,470	981,000 r	7,110	959,000
Type:				
Airfloat	1,210	82,300 r	1,180	85,600
Calcined:[3]				
Pigment-grade	827	259,000	903	261,000
Refractory-grade	442	14,000	485	18,700
Total	1,270	273,000	1,390	280,000
Delaminated	1,240 [4]	153,000 [4]	1,140	150,000
Unprocessed	141	2,380	135	1,970
Water washed	3,610 [4]	471,000 [4]	3,260	442,000
Grand total	7,470	981,000 r	7,110	959,000

rRevised.

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

[2]Includes Alabama, Arkansas, California, Florida, Nevada, North Carolina, Tennessee, and Texas.

[3]Pigment-grade kaolin is low-temperature calcined kaolin and refractory-grade kaolin is high-temperature calcined kaolin.

[4]Some delaminated kaolin production included under "Water washed."

TABLE 9
GEORGIA KAOLIN SOLD OR USED BY PRODUCERS, BY TYPE AND USE[1]

(Thousand metric tons and thousand dollars)

Kind	2006		2007	
	Quantity	Value	Quantity	Value
Type:				
Airfloat	966	61,800	948	67,200
Calcined[2]	1,180	262,000	1,290	267,000
Delaminated	1,240	153,000	1,140	150,000
Unprocessed	--	--	--	--
Water washed	3,530	469,000	3,190	440,000
Total	6,920	945,000	6,570	924,000
Use:				
Domestic:				
Ceramics and glass:				
Catalysts (oil-refining)	106	NA	W	NA
Fiberglass	359	NA	324	NA
Roofing granules	33	NA	35	NA
Other[3]	172 r	NA	340	NA
Fillers, extenders, binders:				
Adhesives	30	NA	43	NA
Paint	343	NA	301	NA
Paper coating	2,400	NA	2,310	NA
Paper filling	420	NA	329	NA
Plastic	49	NA	78	NA
Rubber	151	NA	157	NA
Other[4]	73	NA	41	NA
Heavy clay products[5]	(6)	NA	(6)	NA
Refractories[7]	(6)	NA	(6)	NA
Undistributed[8]	820 r	NA	685	NA
Total	4,950	NA	4,640	NA
Exports:				
Paint	74	NA	69	NA
Paper coating[9]	1,680	NA	1,640	NA
Paper filling[9]	112	NA	122	NA
Rubber	13	NA	19	NA
Undistributed[10]	86	NA	75	NA
Total	1,970	NA	1,930	NA
Grand total	6,920	945,000	6,570	924,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. -- Zero.

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

[2]Includes pigment- and refractory-grade calcined kaolin.

[3]Includes electrical porcelain, fine china/dinnerware, pottery, miscellaneous ceramics, and sanitaryware.

[4]Includes animal feed; asphalt tile (2006); fertilizers; medical, pharmaceuticals and cosmetics; pesticides and related products (2006); and miscellaneous fillers, extenders, and binders.

[5]Includes brick (common and face), portland cement, and miscellaneous clay products.

[6]Withheld to avoid disclosing company proprietary data; included in "Domestic: Undistributed."

[7]Includes firebricks, blocks and shapes, grogs and calcines, high-alumina specialties, kiln furniture, and miscellaneous refractories.

[8]Includes absorbents, chemical manufacturing, floor and wall tiles, heavy clay products, refractories (2006), waterproofing seals, and other unknown uses.

[9]Some export sales may be included under domestic sales.

[10]Includes miscellaneous ceramics, miscellaneous fillers, extenders, and other unknown uses.

TABLE 10
SOUTH CAROLINA KAOLIN SOLD OR USED BY PRODUCERS, BY USE[1]

(Thousand metric tons and thousand dollars)

	2006		2007	
	Quantity	Value	Quantity	Value
Production[2]	294	17,900	297	17,600
Use:				
Ceramics[3]	83	NA	87	NA
Rubber	79	NA	76	NA
Other uses[4]	110	NA	134	NA
Exports[5]	22	NA	W	NA
Total	294	17,900	297	17,600

NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Other uses."

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

[2]Includes airfloat, unprocessed, and calcined kaolin.

[3]Includes catalysts (oil-refining), fiberglass, roofing granules, and sanitaryware.

[4]Includes adhesives, animal feed, brick (common), floor and wall tile, paper coating, plastics, and refractories.

[5]Includes fillers, extenders, and binders.

TABLE 11
KAOLIN SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE[1]

(Thousand metric tons)

Use	2006	2007
Domestic:		
Ceramics:		
Catalyst (oil and gas refining)	163	243
Electrical porcelain	W	W
Fine china and dinnerware	14	13
Floor and wall tile	70	70
Pottery	5	4
Roofing granules	38	39
Sanitaryware	33	30
Miscellaneous	101 r	122
Chemical manufacture	W	W
Civil engineering	W	--
Fiberglass, mineral wool	377	337
Fillers, extenders, binders:		
Adhesive	39	53
Fertilizer	W	W
Medical, pharmaceutical, cosmetic	W	W
Paint	365	321
Paper coating	2,400	2,310
Paper filling	420	329
Pesticide	W	--
Plastic	64	89
Rubber	229	233
Miscellaneous	75	43
Heavy clay products:		
Brick, common and face	115	114
Portland cement	84	90
Refractories[2]	452	502
Miscellaneous applications	393 r	182
Total	5,440 r	5,130
Exports:		
Ceramics	58	W
Paint	91	85
Paper coating	1,680	1,640
Paper filling	112	122
Portland cement	(3)	--
Rubber	35	42
Miscellaneous	61 r	90
Total	2,040	1,980
Grand total	7,470 r	7,110

rRevised. W Withheld to avoid disclosing company proprietary data; included in "Miscellaneous." -- Zero.

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

[2]Includes firebrick (blocks and shapes), grogs and calcines, and miscellaneous refractories.

[3]Withheld to avoid disclosing company proprietary data; included in "Exports: Miscellaneous."

TABLE 12
COMMON CLAY AND SHALE USED IN LIGHTWEIGHT AGGREGATE
PRODUCTION IN THE UNITED STATES BY STATE[1]

(Thousand metric tons and thousand dollars)

State	Concrete block	Structural concrete	Other[2]	Total	
				Quantity	Value[e]
2006:					
Alabama	639	46	76	761	25,800
Arkansas	401	--	--	401	1,040
California	20	63	--	83	3,430
Indiana[e]	135	66	99	299	8,250
Kansas	--	--	78	78	684
Kentucky	137	46	--	183	649
Louisiana	224	51	200	475	23,100
Missouri	--	--	130	130	1,130
Nebraska	--	--	1	1	2
New York	167	352	--	519	25,900
North Carolina[e]	--	--	11	11	95
Ohio	106	63	87	257	9,640
Oklahoma	41	6	--	47	1,340
Texas[e]	47	155	255	457	2,810
Utah	120	79	147	347	6,750
Virginia	--	--	--	--	--
Total	2,040	927	1,090 [r]	4,050	110,000
2007:					
Alabama	599	42	72	713	27,300
Arkansas	408	--	--	408	2,250
California	--	--	--	--	--
Indiana	88	38	113	239	6,580
Kansas	--	--	57	57	498
Kentucky	127	54	--	181	1,200
Louisiana	289	72	120	481	13,300
Missouri	--	--	127	127	1,110
Nebraska	--	--	1	1	3
New York	225	260	--	485	25,400
North Carolina	--	--	8	8	65
Ohio	109	64	100	272	11,200
Oklahoma	36	5	--	41	1,190
Texas	38	142	256	435	3,600
Utah	127	80	156	363	7,600
Virginia	108	2	(3)	115	3,510
Total	2,150	759	689	3,930	105,000

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

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

[2]Includes highway surfacing.

[3]Less than ½ unit.

TABLE 13
COMMON CLAY AND SHALE USED IN BUILDING BRICK
PRODUCTION IN THE UNITED STATES, BY STATE[1, 2]

(Thousand metric tons and thousand dollars)

State	2006		2007	
	Quantity	Value[e]	Quantity	Value[e]
Alabama	1,260	10,400	1,320	12,600
Arkansas	460	698	380	562
California	294	1,030	211	692
Colorado	181	1,310 [r]	154	992
Georgia	1,350	8,020	1,260	7,420
Kentucky[3]	476	2,640 [r]	409	2,350
Maryland	219	W	W	W
Mississippi	549	3,100	508	2,860
North Carolina	2,250	23,500	1,650	18,500
Ohio	438	2,410	495	3,450
Oklahoma	737	1,940	601	1,600
Pennsylvania	662	4,590 [r]	603	3,430
South Carolina	651	2,280 [r]	619	1,410
Tennessee	231	1,530	199	1,360
Texas	1,070	4,670	814	4,360
Virginia	762	1,810	561	1,380
Other[4]	2,210	15,200	1,980	12,700
Total	13,800	85,100 [r]	11,800	75,600

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data; included in "Other."

[1]Includes extruded and other brick.

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

[3]Extruded brick only.

[4]Includes all other States and data represented by symbol W. Excludes Alaska, Nevada, New Hampshire, Rhode Island, Vermont, and Wisconsin.

TABLE 14
U.S. EXPORTS OF CLAYS, BY TYPE[1, 2]

(Thousand metric tons and thousand dollars)

Material	2006		2007		Principal destinations in 2007
	Quantity	Value	Quantity	Value	
Ball clay	140	7,890	83	5,610	Mexico, 47%; Venezuela, 9%; Guatemala, 6%.
Bentonite	1,270	132,000	1,430	158,000	Canada, 36%; Japan, 23%; Netherlands, 17%.
Fire clay	348	38,100	425	47,700	Mexico, 40%; Luxembourg, 37%; Japan, 6%.
Fuller's earth	69	16,400	134	37,700	Japan, 25%; Belgium, 10%; Netherlands, 8%.
Kaolin	3,540	626,000	3,300	615,000	Japan, 21%; Canada, 14%; Mexico, 11%; Finland, 10%.
Clays, n.e.c.	607	181,000	279	63,600	Canada, 57%; Japan, 7%; Mexico, 7%.
Total	5,980	1,000,000	5,650	928,000	

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]The Harmonized Tariff Scheudle of the United States (HTS) codes for ball clay, fuller's earth and clays, n.e.c. changed January 2007. Lower reported exports of ball clay and clays, n.e.c. in 2007 perhaps is do to accounting problems under the new HTS codes rather than an actual decrease in export tonnages.

Source: U.S. Census Bureau.

TABLE 15
U.S. IMPORTS FOR CONSUMPTION OF CLAY, BY TYPE[1]

(Thousand metric tons and thousand dollars)

Material	2006		2007		Principal sources in 2007
	Quantity	Value	Quantity	Value	
China clay or kaolin	303	55,600	194	48,500	Brazil, 95%; United Kingdom, 4%.
Fire clay	(2)	168	2	584	China, 90%; Canada, 7%.
Decolorizing earths and fuller's earth	3	223	--	--	XX
Bentonite	13	3,100	11	2,390	Greece, 66%; Mexico, 12%; China 8%; Canada, 6%.
Common blue clay and other ball clay	1	233	--	--	XX
Other clay	5	3,650	--	--	XX
Chamotte or Dina's Earth	(2)	18	--	--	XX
Artificially activated clay and activated earth	21	16,200	23	22,400	Mexico, 63%; Germany, 17%; Netherlands, 7%.
Total	346	79,200	231	73,900	

XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 16
BENTONITE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	2003	2004	2005	2006	2007[e]
Algeria[4]	25,346	30,319	29,029	27,110 [e]	32,600 [5]
Argentina	146,845	163,028	247,101 [r]	256,165 [r]	255,000
Armenia[e]	642	561	732 [5]	720 [r, 5]	1,129 [5]
Australia[e, 4]	145,000	265,000	223,000	220,000	255,000
Azerbaijan[e]	40,000	40,000	40,000	40,644 [5]	50,459 [5]
Bolivia	227	548	590	600 [e]	500
Bosnia and Herzegovina	16,967 [r]	24,353 [r]	24,882 [r]	24,050 [r]	15,000
Brazil, beneficiated	198,981	227,126 [r]	221,300 [r]	235,481 [r, p]	240,000 [p]
Bulgaria	146,000	225,000	181,000	216,000 [r, 5]	220,000
Burma	856	800 [e]	800 [e]	800 [e]	800
Chile	748	101	--	--	533 [5]
Commonwealth of Indepedent States[e, 6]	750,000	750,000	750,000	750,000	750,000
Croatia	13,568	16,000 [r]	17,391 [r]	16,410 [r]	19,578 [5]
Cyprus	144,859	155,717	150,000 [e]	150,000	150,000
Czech Republic	199,000 [e]	201,000	186,000	220,000	220,000
Egypt[e]	50,000	50,000	50,000	50,000	50,000
Georgia[e]	9,700	1,800 [5]	7,876 [r, 5]	4,487 [r, 5]	5,000
Germany	478,796	404,549	352,374	363,998 [r]	365,000
Greece[e]	950,000	950,000	950,000	950,000	950,000
Guatemala	6,438	81,688	135,451	20,034 [5]	20,000 [5]
Hungary	5,770 [r]	6,449 [r]	19,837 [r]	6,600 [r]	20,846 [5]
Indonesia[e]	5,000	5,000	5,000	5,500 [r]	5,500
Iran[7]	140,528	193,046	261,888 [r, 5]	260,000 [r, e]	250,000
Italy[e]	474,000	475,000	446,000	470,000 [r, 5]	599,775 [5]
Japan	425,945	455,282	421,629	420,000	420,000
Kenya[e]	50	50	60	60	60
Macedonia[e]	25,000	25,000	25,000	25,000	25,000
Mexico	464,056	564,015	425,630	435,273 [r, p]	435,000
Morocco	67,700	85,400	85,400 [e]	80,400	81,000
Mozambique	--	3,336	17,318 [r]	3,515 [r]	3,600
New Zealand, processed[e]	10,940	10,050	7,590	3,028 [r]	4,000
Nicaragua[e]	-- [r]	-- [r]	-- [r]	-- [r]	--
Pakistan	11,290	6,316	15,671	16,000 [e]	17,000
Peru	14,980	18,471	18,500	18,500	21,451 [5]
Philippines	3,720 [r]	3,560 [5]	1,000 [r, 5]	1,000 [r, e]	1,000
Poland[8]	31,648	66,143	86,331	93,880 [r]	105,943 [5]
Romania	21,724 [r]	22,337 [r]	20,226 [r]	21,165 [r, 5]	14,713 [5]
Serbia	75 [9]	75 [9]	75 [9]	75	75
Slovakia	74,938	69,252 [r]	75,752 [r]	93,373 [r]	121,347 [5]
South Africa[10]	145,060	55,859	139,833	32,878	45,778 [p]
Spain[e]	103,174	156,760	105,000	105,000 [r]	105,000
Turkey	831,146	850,000 [e]	925,000 [e]	950,000	930,000
Turkmenistan[e]	50,000	50,000	50,000	50,000	50,000
Ukraine[e]	300,000	300,000	300,000	300,000	300,000
United States	3,770,000	4,550,000	4,710,000	4,940,000	4,820,000 [5]
Zimbabwe[10]	-- [e]	500	500	500	100
Total	10,300,000	11,600,000 [r]	11,700,000 [r]	11,900,000 [r]	12,000,000

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

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

[2]Table includes data available through August 21, 2008.

TABLE 16—Continued
BENTONITE: WORLD PRODUCTION, BY COUNTRY[1, 2]

[3]In addition to the countries listed, Canada and China are thought to produce bentonite, but output is not reported, and available information is inadequate to make reliable estimates of output levels.
[4]Includes bentonitic clays.
[5]Reported figure.
[6]Information is inadequate to formulate reliable estimates for individual countries, except Armenia, Georgia, Turkmenistan, and Ukraine.
[7]Year beginning March 21 of that stated.
[8]Montmorillite type bleaching clay.
[9]Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.
[10]May include other clays.

TABLE 17
FULLER'S EARTH: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	2003	2004	2005	2006	2007[e]
Algeria	2,573	2,284	831	--	--
Australia, attapulgite	11,000 [r]	10,000 [r]	9,800 [r]	10,000	10,000
Guatemala	9	9	--	19	20
Italy[e]	3,000 [r]	3,000 [r]	3,000 [r]	3,000 [r]	3,000
Mexico	152,917	129,502	107,265	102,400 [r]	102,000
Morocco, smectite[e]	14,944 [4]	15,000	15,000	15,000	15,000
Pakistan[e]	16,670	13,986	17,001	18,000	19,000
Senegal, attapulgite	194,900	200,000 [e]	127,000 [r]	140,000 [r]	140,000
South Africa, attapulgite	14,585	20,419	33,682 [r]	49,225	68,377 [p, 4]
Spain:					
Attapulgite	18,975	20,796	20,000 [e]	20,000 [e]	20,000
Sepiolite	690,395	851,647	850,000 [e]	850,000 [e]	850,000
United Kingdom[e, 5]	19,000 [r]	140,000	115,000 [r]	-- [r]	--
United States[6]	3,600,000	3,260,000	2,730,000	2,540,000	2,660,000 [4]
Total	4,740,000 [r]	4,670,000 [r]	4,030,000 [r]	3,750,000 [r]	3,890,000

[e]Estimated. [p]Preliminary. [r]Revised. -- Zero.
[1]Excludes centrally planned economy countries and former such countries, some of which presumably produce fuller's earth but for which no information is available. Table includes data available through August 21, 2008.
[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]In addition to the market economy countries listed, France, India, Iran, Japan, and Turkey have reportedlyproduced fuller's earth in the past and may continue to do so, but output is not reported, and available information is inadequate to make reliable estimates of output levels.
[4]Reported figure.
[5]Salable product.
[6]Sold or used by producers.

TABLE 18
KAOLIN: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	2003	2004	2005	2006	2007[e]
Algeria	16,591	24,299	34,386	32,523	106,567 [4]
Argentina[e]	19,219	39,072 [r]	54,903 [r]	49,619 [r]	50,000
Australia, includes ball clay[e]	280,000	285,000	230,000	250,000	250,000
Austria, marketable[e]	50,000	50,000	50,000	50,000	50,000
Bangladesh[e, 5]	8,200	8,300	8,400	8,500	8,600
Belgium[e]	300,000	300,000	300,000	300,000	300,000
Bosnia and Herzegovina, crude	50,000 [r]	46,000 [r]	45,000 [r]	42,422 [r]	42,000
Brazil, beneficiated	2,081,039	2,381,000	2,410,000	2,455,000 [r]	2,500,000 [p]
Bulgaria	1,137,000 [r]	1,291,000 [r]	1,380,000 [r]	1,658,000 [r]	1,631,000 [4]
Chile	11,500	7,133	15,183	44,642	87,901 [4]
Czech Republic	4,155,000	3,862,000	3,882,000	3,768,000	3,800,000 [4]
Denmark, sales[e]	2,500	2,500	2,500	2,500	2,500
Ecuador	11,883	5,646	25,078	11,504 [r]	18,618 [4]
Egypt[e]	300,000	300,000	300,000	300,000	300,000
Eritrea	281	101	100	100	100
Ethiopia	3,088	4,251	3,726	1,641	1,700
France, marketable[e]	339,000 [r]	323,000 [r]	316,000 [r]	300,000	307,253 [4]
Germany	3,503,589	3,751,874	3,767,662	3,815,173 [r]	3,800,000
Greece[e]	60,000	60,000	60,000	60,000	60,000
Guatemala	1,497	-- [r]	4,107	4,395	4,500
Hungary, processed[e]	13,250 [4]	7,530 [r]	7,000	7,000 [r]	3,000 [4]
India:[e]					
Processed	180,000	180,000	190,000	200,000	200,000
Salable crude	550,000	550,000	560,000	560,000	570,000
Indonesia[e]	15,000	15,000	15,000	15,000	15,000
Iran	484,507	531,109	311,501 [r]	310,000 [r, e]	350,000
Italy, kaolinitic earth	690,565 [r]	567,873 [r]	506,597 [r]	469,702 [r]	584,121 [4]
Japan	12,409	11,553	10,500	10,000 [e]	10,000
Jordan	217,248 [r]	216,566	168,264 [r]	112,787 [r]	110,000
Kazakhstan[e]	-- [r]	-- [r]	-- [r]	-- [r]	--
Kenya	740	760	780	780	830
Korea, Republic of	3,009,245	2,773,220	2,767,091	2,399,458	2,630,356 [4]
Kyrgyzstan[e]	381,100 [4]	400,000	400,000	400,000	400,000
Madagascar[e]	170	170	170	170	170
Malaysia	425,942	326,928	494,511	341,223 [r]	350,000
Mexico	798,407	654,711	877,147	961,800 [r, p]	962,000
New Zealand	14,770	15,500	15,750 [r]	14,864 [r]	15,000
Nigeria[e]	52,000 [r]	58,000 [r]	93,000 [r]	100,000 [r]	100,000
Pakistan	39,575	25,204	37,732	38,000 [e]	39,000
Paraguay[e]	66,600	66,600	66,600	66,000	66,000
Peru	2,653	2,720	2,700 [r]	2,750 [r]	7,532 [4]
Poland, washed	169,034	191,312	159,207	199,755 [r]	210,373 [4]
Portugal[e]	150,000	152,077	160,000	160,000	160,000
Romania	25,741	22,337	20,266 [r]	11,063	6,879 [4]
Russia, concentrate[e]	45,000	45,000	45,000	45,000	45,000
Serbia					
Crude	99,460 [r, 6]	95,000 [r, 6]	95,000 [r, 6]	110,000 [r]	110,000
Washed	16,500 [r, 6]	16,000 [r, 6]	16,000 [r, 6]	18,000 [r]	10,000
Slovakia	-- [r]	-- [r]	-- [r]	-- [r]	--

See footnotes at end of table.

TABLE 18—Continued
KAOLIN: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	2003	2004	2005	2006	2007[e]
South Africa	86,365	81,901	59,356	51,602	51,602 [p]
Spain, marketable, crude and washed[7]	450,000 [e]	437,990	450,000	450,000	450,000
Sri Lanka[e]	9,073 [4]	9,200	9,400	9,500	9,500
Thailand, beneficiated	184,562	200,761	156,853 [r]	157,900 [r]	200,000
Turkey	370,455	536,008	580,000 [e]	650,000 [r, e]	580,000
Uganda	--	537	31,000 [e]	30,000 [e]	30,000
Ukraine	1,176,000 [r]	1,468,000 [r]	1,566,000 [r]	1,777,000 [r]	2,386,000 [4]
United Kingdom, sales[8]	2,097,000 [r]	1,995,000 [r]	1,911,000 [r]	1,800,000 [r]	1,800,000
United States[9]	7,680,000	7,760,000	7,800,000	7,470,000	7,110,000 [4]
Uzbekistan[e]	5,500,000	5,500,000	5,500,000	5,500,000	5,500,000
Venezuela[e]	10,000	10,000	10,000	10,000	10,000
Vietnam[e]	650,000	650,000	650,000	650,000	650,000
Zambia[e]	200	200	200	200	200
Total	38,000,000 [r]	38,300,000 [r]	38,600,000 [r]	38,300,000 [r]	39,000,000

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

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

[2]Table includes data available through August 21, 2008.

[3]In addition to the countries listed, China, Morocco, and Suriname may also have produced kaolin, but information is inadequate to make reliable estimates of output levels.

[4]Reported figure.

[5]Data for year ending June 30 of that stated.

[6]Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

[7]Includes crude and washed kaolin and refractory clays not further described.

[8]Dry weight.

[9]Kaolin sold or used by producers.