



# 2014 Minerals Yearbook

---

## CLAY AND SHALE [ADVANCE RELEASE]

---

# CLAY AND SHALE

By Daniel M. Flanagan

**Domestic survey data and tables were prepared by Robin C. Kaiser, statistical assistant, and the world production tables were prepared by Lisa D. Miller,<sup>1</sup> international data coordinator.**

In 2014, domestic production (sold or used by producers) of all clays excluding attapulgite increased to 25.9 million metric tons (Mt) valued at \$1.58 billion, up by 5% from 24.7 Mt valued at \$1.53 billion in 2013 (table 1). Production, however, remained low compared with the years prior to the 2008–9 recession, with sales in 2014 representing approximately 70% of the quantity sold and 90% of the sales value in 2007 (Virta, 2013, p. 18.8). Common clay and shale accounted for 45% of the sales tonnage in 2014, and kaolin accounted for 57% of the value (tables 1, 5, 8). Exports of all clays increased slightly to 4.19 Mt valued at \$942 million in 2014 compared with 4.14 Mt valued at \$892 million during the prior year, and imports rose by 11% to 576,000 metric tons (t) valued at \$96.9 million from 518,000 t valued at \$86.9 million (table 1). World production of bentonite was 16.8 Mt, an increase of 4% relative to 16.1 Mt in 2013; world production of fuller's earth was 3.35 Mt, a decline of 3% from 3.45 Mt; and global kaolin production increased by 7% to 36.5 Mt compared with 34 Mt in 2013 (tables 15–17).

Throughout the first three decades of the 20th century, total domestic clay production increased at a relatively steady pace, rising from 1.1 Mt in 1900 to 3.9 Mt in 1930. Production declined during the early 1930s, increased rapidly from about 1940 onward to a peak of 58.8 Mt in 1973, and then trended downward during the remainder of the 1970s into the early 1980s. The mid-1980s saw a resurgence in clay production, and annual domestic output plateaued at an average of approximately 41.5 Mt from the late 1980s into the mid-2000s. Production decreased sharply from 2006 to 2009 owing to the economic recession and has increased slightly since that time (fig. 1).

Since about 1940, common clay and shale have accounted for an annual average of roughly 60% of total clay production, and the trend in total U.S. clay production has paralleled that of common clay and shale. Fire clay was the dominant clay type prior to the early 1940s and represented nearly 70% of the clay sales tonnage from 1900 through 1939. Fire clay production grew rapidly beginning in the 1940s, plateaued in the 1950s and 1960s, and declined from the late 1960s onward. Production of fire clay in 2014 was 26% of that in 1900. In contrast to common clay and fire clay, production of ball clay, bentonite, fuller's earth, and kaolin mostly increased at a relatively steady pace throughout much of the 20th century, with few major fluctuations in output levels. Kaolin production has trended downward since the late 1990s, bentonite production decreased in the early 1980s and has steadily increased since, and production of fuller's earth has mostly fallen since 2003 (fig. 1).

In general, variations in sales of clay and shale since 1900 coincided with the rise and fall of the U.S. economy because

much of the clay use was associated with construction. A few specific factors that affected sales of clay and shale were increased oil drilling in the 1920s and its decline in the 1980s (mostly affecting bentonite), the Great Depression of the 1930s, economic growth that accompanied World War II, changes in refractory demands beginning in the 1960s (fire clay), decreased use of brick in housing beginning in the 1970s (common clay), the energy crisis of the 1970s (bentonite), and the popularity of clumping pet waste absorbents (fuller's earth) and the introduction of precipitated calcium carbonate into the domestic paper market (kaolin) in the 1990s.

The major clay markets in the early 1900s were for fire clay products, predominantly firebrick and refractory mortars. Other leading end uses included common brick, drain tile, sewer tile, and structural tile for fire clay and common clay. Sales of the other clay types were much smaller; primary uses were in ceramics (ball clay and kaolin), decolorizing oils and greases (bentonite and fuller's earth), foundry sand (bentonite), and paper (kaolin). In 2014, major clay markets included common brick (common clay and shale), drilling mud (bentonite), lightweight aggregate (common clay and shale), paper coating and filling (kaolin), pet waste absorbents (bentonite and fuller's earth), portland cement (common clay and shale), and refractories (kaolin and fire clay).

## Production

The U.S. Geological Survey (USGS) has six classifications for clays mined in the United States: ball clay, bentonite, common clay, fire clay, fuller's earth, and kaolin. Ball clays consist primarily of kaolinite with minor to major amounts of illite, chlorite, smectite minerals, quartz, and organic materials. Bentonites comprise smectite minerals (usually montmorillonite) with minor amounts of feldspar, biotite, and quartz. Common clays contain illite and chlorite as major components. Fire clay comprises mainly kaolinite, halloysite, and (or) diaspore. Fuller's earth consists primarily of palygorskite (attapulgite) or calcium-rich montmorillonite nonplastic clays with quartz. Kaolin predominantly includes kaolinite or kaolin-group minerals, although smectite minerals, mica, quartz, and rutile are also components of kaolin deposits. Mineral composition, plasticity, color, absorption qualities, and firing characteristics are a few of the attributes used to distinguish between the different clay types.

Clay mineral terminology is often used inconsistently and can vary depending on geologic origin, mineralogy, and commercial application. For instance, bentonite was originally defined as a clay produced by chemical alteration of igneous rock (usually tuff or volcanic ash), yet clay from many deposits of nonvolcanic origin is sold as bentonite. The USGS generally does not attempt to precisely identify the clay types produced at

---

<sup>1</sup>Deceased.

domestic operations and simply uses the terminology reported by the producing company.

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 about 45% of the total clay and shale tonnage sold or used in 2014 (table 1). Data for nonrespondents were estimated from company reports, trade literature, and (or) prior reported production levels adjusted by trends in the industry, employment hours, and other guidelines.

In 2014, approximately 150 companies mined clay and shale in the United States and produced a total of 25.9 Mt valued at \$1.58 billion (excluding attapulgite), an increase of 5% from 24.7 Mt valued at \$1.53 billion in 2013 and slightly higher than the 25.6 Mt valued at \$1.48 billion generated in 2010 (table 1). The 20 leading companies, many with multiple operations, accounted for roughly 65% of the tonnage and nearly 90% of the value for all types of clay sold or used (excluding attapulgite). The 10 leading producer companies were, in alphabetical order, American Colloid Co./Minerals Technologies Inc. (bentonite); Ash Grove Cement Co. (common clay and shale); BASF Corp. (bentonite, fuller's earth, and kaolin); Bentonite Performance Minerals, LLC (bentonite); Imerys S.A. (ball clay and kaolin); KaMin LLC (kaolin); Nestlé S.A. (bentonite and fuller's earth); Oil-Dri Corp. of America (fuller's earth); Thiele Kaolin Co. (kaolin); and Unimin Corp./SCR-Sibelco N.V. (ball clay and kaolin).

Clay production was reported or estimated in all States except Alaska, Delaware, Hawaii, Idaho, Maine, New Hampshire, New Jersey, Rhode Island, Vermont, and Wisconsin. Companies that mined clay for uses such as construction fill, landfill caps, and landscaping but did not operate mills or plants were not included in the USGS canvass of the clay and shale industry. These companies operated in most, if not all, States. The 10 leading producer States were, in decreasing order of tonnage, Georgia, Wyoming, Texas, Alabama, Missouri, Oklahoma, Tennessee, North Carolina, Oregon, and California, which collectively accounted for 76% of U.S. clay production by quantity (table 2). Most clay mining in the United States was by open pit methods, with less than 1% of the output originating from underground mines. Most subsurface production was in Ohio, where the clays were mainly underclays associated with coal mining.

## Ball Clay

**Production.**—In 2014, four companies mined ball clay in five States. One company in Indiana reported production of ball clay, but this was probably fire clay. Domestic output (sold or used by producers) increased by 3% to 1.03 Mt valued at \$45.2 million from 1 Mt valued at \$42.8 million in 2013 (table 3). Over the past 5 years, U.S. ball clay output increased by 13% from 912,000 t valued at \$41.3 million in 2010 (Virta, 2013, p. 18.9). Ball clay sales in 2014 represented 4% of the U.S. sales tonnage for all clay types and 3% of the sales value (excluding attapulgite). Tennessee was the leading producer State and accounted for 63% of total U.S. ball clay production, followed by, in descending order of tonnage, Texas, Mississippi, Kentucky, and Indiana.

**Consumption.**—The two principal domestic markets for U.S. ball clay were ceramic floor and wall tile (41% of sales) and sanitaryware (percentage withheld to avoid disclosing company proprietary data). Ball clay was also sold to manufacture bricks, electrical porcelain, fine china, pottery, refractory products, roofing granules, and other types of ceramics (table 3). Ball clay producers reported sales for fiberglass and filler, extender, and binder applications, but these were likely to have been kaolin mined or purchased by the ball clay operations. Exports by producers accounted for 13% of ball clay sales.

The Tile Council of North America reported that U.S. shipments (excluding exports) of ceramic tile increased by 3.3% in 2014 and that the value of these shipments rose by 6.8% (Whitmire, 2015). The quantity of ball clay sold by domestic producers to the floor and wall tile industry in the United States as reported to or estimated by the USGS likewise increased by 7% to 422,000 t compared with 395,000 t in 2013 (table 3). Use of ball clay in sanitaryware also rose compared with that of 2013. Increased sales of ball clay for these construction applications corresponded to 5% growth in U.S. construction spending—to \$962 billion in 2014 from \$918 billion in 2013 (U.S. Census Bureau, 2015b). Export sales declined by 19% from the prior year, consistent with a decrease in ball clay exports reported by the U.S. Census Bureau (table 13).

**Prices.**—Ex-works ball clay unit values for individual domestic operations ranged from \$29 to \$75 per ton, and the average unit value increased slightly to \$44 per ton from \$43 per ton in 2013 (table 3). The average free alongside ship (f.a.s.) value of exported ball clay was \$228 per ton in 2014 compared with \$127 per ton in 2013, and the average customs value for imported ball clay fell to \$314 per ton from \$373 per ton (tables 13, 14). Low-tonnage shipments of high-value ball clay resulted in much of the change in unit values for exports and imports.

**Foreign Trade.**—According to the U.S. Census Bureau, ball clay exports were 33,000 t valued at \$7.53 million in 2014 compared with 52,000 t valued at \$6.61 million in 2013 (table 13), whereas USGS data indicate that exports totaled 138,000 t (table 3). Most of the difference between exports reported by the USGS and the U.S. Census Bureau involved shipments to Mexico, whose trade statistics suggested that imports of ball clay from the United States were reported under Mexico's Harmonized Tariff Schedule (HTS) code for kaolin and other kaolinic clays. Exports of ball clay were primarily shipped to Belgium (14%), Nicaragua (12%), and Guatemala and Japan (11% each). Ball clay imports were 551 t valued at \$173,000 compared with 468 t valued at \$174,000 in 2013 (table 14). The majority of imports originated from the United Kingdom (76%).

## Bentonite

**Production.**—Twenty-one companies produced nonswelling and (or) swelling bentonite in 10 States during 2014. Seventeen companies mined swelling (sodium) bentonite in eight States and five companies mined nonswelling (calcium) bentonite in three States. About 4.8 Mt of swelling and nonswelling bentonite valued at \$329 million was sold or used, a 10%

increase in quantity from 4.35 Mt valued at \$282 million during 2013 (table 4). Since 2010, total domestic production of bentonite increased by 4% from 4.6 Mt valued at \$266 million (Virta, 2013, p. 18.9). In 2014, approximately 19% of the total domestic clay tonnage and 21% of the total domestic value (excluding attapulgite) consisted of bentonite sales. Production of swelling bentonite rose by 10% to 4.65 Mt valued at \$318 million in 2014 compared with 4.22 Mt valued at \$272 million in 2013. Wyoming led all States in sales of swelling bentonite with 93% of the total, followed by, in descending order of tonnage, Utah, Montana, Texas, California, Oregon, Nevada, and Colorado. Production of nonswelling bentonite in 2014 was 156,000 t valued at \$11.2 million, an 18% increase from 132,000 t valued at \$9.96 million in 2013. The State rankings for production of nonswelling bentonite, in descending order of tonnage, were Alabama, California, and Mississippi.

In 2014, Minerals Technologies acquired AMCOL International Corp., the parent corporation of American Colloid Co. and one of the world's leading producers of bentonite (Minerals Technologies Inc., 2014). In addition, Imerys announced plans to purchase S&B Industrial Minerals S.A., a global producer of bentonite for foundry sand, drilling mud, and sealing applications. The acquisition was completed in early 2015. S&B, which also produces perlite and wollastonite, was the largest company acquired by Imerys in the past 15 years (Imerys S.A., 2015, p. 7).

The city of Belle Fourche, SD, was seeking funding for construction of a new railroad terminal. Several leading producers of bentonite operate in the area, including Bentonite Performance Minerals and Minerals Technologies. As a result of railcar shortages, these companies were frequently unable to deliver their products to customers. Improved transportation logistics resulting from construction of a new terminal had the potential to boost bentonite production (Choudhury, 2014).

**Consumption.**—Augmented sales to the domestic pet waste absorbent and drilling mud markets accounted for much of the increase in bentonite production in 2014. Sales to the U.S. pet waste absorbent industry represented 29% of total bentonite sales and rose by 23% to 1.39 Mt from 1.13 Mt in 2013 (table 4). This growth is consistent with a reported increase of 4% in U.S. consumer spending on pets (American Pet Products Association, 2015). Use of domestic bentonite in drilling mud within the United States (26% of total sales) rose by 33%, to 1.24 Mt from 932,000 t, and exports of bentonite for drilling mud applications increased significantly as well (tonnage withheld to avoid disclosing company proprietary data). U.S. drilling activity increased during 2014; at yearend, the number of operating rotary oil and gas rigs was 5% higher in the United States than at yearend 2013 (Baker Hughes Inc., 2015). Sales of bentonite for domestic foundry sand and pelletizing (iron ore) applications were withheld to protect company proprietary data, but output of each decreased from 2013 levels. Reported use of domestic bentonite in foundry sand within the United States declined despite an increase in shipments and new orders for fabricated metal parts, machinery, and motor vehicles (U.S. Census Bureau, 2015a), although some sales of bentonite for foundry sand may have been reported under “Miscellaneous.”

Two operations that reported U.S. sales of bentonite for iron ore pelletizing in 2013 did not report any domestic sales for this purpose in 2014. Foundry sand and iron ore pelletizing applications were the third- and fourth-ranked domestic end uses for bentonite, respectively, and together represented more than 20% of all bentonite use (domestic and export). Almost 20% of total bentonite sales in 2014 consisted of exports.

The leading markets shown in table 4 are representative of those for swelling bentonite, which accounted for 97% of total bentonite sales. In decreasing order of tonnage, the domestic end-use rankings for nonswelling bentonite were foundry sand, water treatment and filtering, pet waste absorbents, unknown applications, chemical manufacturing, animal feed and fertilizers, pesticides, waterproofing and sealing, and miscellaneous ceramics. Nonswelling bentonite made up 100% of sales (domestic and international) for pesticides, 64% of sales for water treatment and filtering, and 57% of sales for fertilizers, but swelling bentonite dominated all other markets. Swelling bentonite accounted for 100% of sales for drilling mud and iron ore pelletizing, more than 90% of sales for pet waste absorbents, and more than 75% of sales for foundry sand.

**Prices.**—The average unit value (free on board mine or plant) for nonswelling bentonite was \$72 per ton in 2014, down from \$75 per ton in 2013, whereas that for swelling bentonite increased to \$68 per ton from \$65 per ton (table 4). Nonswelling bentonite prices for individual operations ranged from \$19 to \$129 per ton, and swelling bentonite prices ranged from \$12 to \$441 per ton, but values for most companies were between \$33 and \$96 per ton. The average f.a.s. value of exported bentonite was \$198 per ton in 2014, up from \$177 per ton in 2013 (table 13), and the average customs value of imported bentonite was \$1,160 per ton compared with \$938 per ton in 2013 (table 14). Small shipments of high-value bentonite affected the unit values for exports and imports.

At yearend 2014, prices reported in the trade literature for bentonite from Wyoming, ex-works, were as follows: bulk, crude form for iron ore pelletizing, \$75 to \$79 per ton; foundry grade, \$107 to \$137 per ton; pet waste absorbent grade, \$57 to \$72 per ton; and American Petroleum Institute grade, \$105 to \$149 per ton. List prices of bentonite for pet waste absorbent (crushed, dried, loose in bulk) that was shipped from Kandla, India, were \$34 to \$38 per ton (free on board). Prices for foundry-grade bentonite (crude and dried, in bulk, free on board) from Milos, Greece, ranged from approximately \$74 to \$98 per ton (Syrett, 2015).

**Foreign Trade.**—Bentonite exports reported by the U.S. Census Bureau rose slightly to 901,000 t valued at \$178 million in 2014 from 890,000 t valued at \$157 million in 2013 (table 13), whereas exports reported by the USGS increased by 13% (table 4). Some discrepancy typically occurs between export data reported by producers and U.S. Census Bureau data because producers often include a portion of the exports destined for Canadian and Mexican markets under domestic sales. In addition, some bentonite is packaged domestically and then exported as a finished product, such as pet waste absorbent. Sales through U.S. mineral brokers, where producers do not know if the bentonite is exported or used domestically, could also contribute to the discrepancy. Companies in the United



States mainly exported bentonite to Canada (47% of exports) and Japan (14%).

Bentonite imports included untreated bentonite clay and chemically or artificially activated materials. Imports of untreated bentonite in 2014 were up by 38% to 22,000 t valued at \$25.6 million compared with 16,000 t valued at \$15 million in 2013. Imports of artificially activated material totaled 26,000 t valued at \$14 million in 2014 and 24,000 t valued at \$14 million in 2013 (table 14). U.S. companies primarily received import shipments of untreated bentonite from Greece (27%), China (24%), and the United Kingdom (20%) and shipments of artificially activated material from Mexico (88%).

## Common Clay and Shale

**Production.**—Common clay and shale were produced by about 100 companies for manufacturing products in 37 States during 2014. The quantity of common clay and shale sold or used increased by 5% to 11.6 Mt valued at \$129 million compared with 11 Mt valued at \$128 million in 2013 (table 5). Production of common clay and shale within the United States in 2010 was 11.9 Mt valued at \$146 million, 3% higher by quantity than output in 2014 (Virta, 2013, p. 18.10). Common clay and shale represented 45% of the total U.S. clay sales tonnage and 8% of the total sales value (excluding attapulgite) in 2014. The 10 leading producer States were, in descending order of tonnage, Texas, Alabama, Oklahoma, North Carolina, Oregon, Ohio, California, New York, Arkansas, and Kansas. These 10 States combined accounted for 68% of sales of common clay and shale produced in the United States. An undetermined amount of common clay that was used for construction fill, landfill caps, and landscaping was also produced in most, if not all, States.

Cherokee Brick and Tile Co. bought the former Tri-State Brick and Tile Co. plant and mine in Jackson, MS, which had been dormant since 2012. The company planned to restart mining operations and begin manufacturing bricks by early 2015. At full capacity, the plant was expected to employ about 100 workers (Carter, 2014).

**Consumption.**—Brick manufacture remained the leading domestic market for common clay and shale in 2014, accounting for 42% of sales (table 5). The brick market share increased for the first time since 2005, rising by 5% compared with that in 2013, but sales for brick were 66% lower than those in 2004 (Virta, 2007, p. 18.12). The increase in brick use corresponded to the ongoing recovery of the U.S. housing market, where housing starts increased by 8% in 2014 relative to those in 2013 (U.S. Census Bureau, 2015c). The brick industry continued to be hindered, however, by shifts to the use of alternative materials and construction of multifamily dwellings (Boral Ltd., 2015, p. 11, 13). The second-ranked end use for U.S. common clay and shale was for the manufacture of portland cement (29% of sales). This use increased slightly in 2014, consistent with an increase in domestic shipments of portland and blended cements by U.S. producers (van Oss, 2015, p. 1). The lightweight aggregate industry (including concrete block, highway surfacing, and structural concrete) was the third-ranked consumer of common clay and shale (22% of sales). Other end

uses included ceramic floor and wall tile, heavy-clay (nonbrick) products, and refractory products.

**Prices.**—Unit values (free on board mine or plant) for all common clay and shale sold in the United States by domestic producers varied from less than \$1 to \$66 per ton in 2014, and the average unit value was \$11 per ton, down slightly from \$12 per ton in 2013 (table 5). The average unit value of common clay and shale used to produce lightweight aggregate was estimated to be \$31 per ton in 2014 compared with \$33 per ton in 2013, and the average unit value of common clay and shale used to produce building brick was estimated to be \$6 per ton in 2014 and \$5 per ton in 2013 (table 12). Prices for common clay and shale should be viewed with caution because most producers do not sell their clay directly but use it to manufacture products.

## Fire Clay

**Production.**—In 2014, five firms were known to mine fire clay in four States. Fire clay production (sold or used by producers) increased by 14% to 222,000 t valued at \$3.88 million from 194,000 t valued at \$3.46 million in 2013 (table 6). Over the past 5 years, domestic output of fire clay rose by 3% from 216,000 t valued at \$6.12 million in 2010 (Virta, 2013, p. 18.11). Fire clay made up less than 1% of the tonnage and value of all clays sold in the United States during 2014 (excluding attapulgite). Missouri was the leading producer State, followed by, in descending order of tonnage, Washington, Texas, and Colorado. Year-to-year production of fire clay has become more variable in recent years as common clay producers randomly entered and exited the fire clay market in response to short-term customer demands.

**Consumption.**—Leading domestic markets for fire clay were, in descending order of tonnage, portland cement, common brick, ceramic floor and wall tile, firebrick, refractory grogs and calcines, refractory mortar and cement, miscellaneous refractory products, pottery, and miscellaneous ceramics. Data for most end uses were withheld to avoid disclosing company proprietary data (table 6).

**Prices.**—The average ex-works fire clay unit value of domestic operations decreased slightly to \$17 per ton in 2014 compared with \$18 per ton in 2013 (table 6). Unit values for individual producers ranged from less than \$1 to \$44 per ton. The average f.a.s. value of exported fire clay was \$222 per ton, up from \$153 per ton during the prior year (table 13), and the average customs value of imported fire clay was \$419 per ton, up from \$383 per ton (table 14). Small, high-value shipments for exports and imports affected the overall unit values.

**Foreign Trade.**—Exports of fire clay and refractory-grade kaolin appear to have been categorized under the same HTS code in recent years. In 2014, approximately 75% of the exports reported by the U.S. Census Bureau under the HTS code for fire clay were thought to be refractory-grade kaolin based on the locations of ports from which the material was shipped. Exports of fire clay and refractory-grade kaolin decreased by 12% to 237,000 t valued at \$52.7 million from 268,000 t valued at \$41.1 million in 2013 (table 13). The principal destinations for U.S. exports in 2014 were Luxembourg (28%), Mexico

(26%), and Japan (15%). Imports in 2014 totaled 6,000 t valued at \$2.51 million, up 100% from 3,000 t valued at \$1.15 million in 2013 (table 14). Nearly all of the fire clay imported into the United States originated in China (99%).

### Fuller's Earth

**Production.**—Eleven companies operating mines in 11 States sold varieties of fuller's earth in 2014. Attapulgitite was produced by four companies in three States; gellant grades of attapulgitite were mined by three companies in western Florida, southwestern Georgia, and southern Nevada, and sorbent grades of attapulgitite were mined by one company in southwestern Georgia. Montmorillonite was produced by eight companies operating in nine States. To be consistent with past reporting, production and end-use data for sorbent grades of attapulgitite were grouped with montmorillonite-type fuller's earth, whose major market was also sorbent applications.

Domestic producers sold 1.98 Mt of the montmorillonite variety of fuller's earth in 2014, virtually unchanged from 1.99 Mt in 2014, but the value of the sales fell by 4% to \$169 million from \$175 million (table 7). In 2010, U.S. production of montmorillonite was 2.05 Mt valued at \$201 million, about 4% higher than that in 2014 (Virta, 2013, p. 18.11). Sales of montmorillonite in 2014 represented 8% of the tonnage and 11% of the value of total domestic clay sales (excluding attapulgitite). Montmorillonite-type fuller's earth was produced, in decreasing order of tonnage, in Missouri, Georgia, Virginia, Mississippi, California, Tennessee, Illinois, Kansas, and Texas. The four leading States accounted for 83% of sales. Attapulgitite production data were withheld to avoid disclosing company proprietary data, but sales increased by an estimated 28% in 2014 compared with those of 2013. Florida led in the production of attapulgitite, followed by Georgia and Nevada.

**Consumption.**—Absorbents (pet waste absorbents, oil and grease absorbents, and miscellaneous absorbents, in decreasing order by tonnage) were the leading U.S. market for montmorillonite (75% of sales), followed by miscellaneous uses (16%); miscellaneous fillers, extenders, and binders (5%); and animal feed (3%). Miscellaneous uses included civil engineering; drilling mud; and filtering, clarifying, and decolorizing of animal, mineral, and vegetable oils and greases (table 7). The leading domestic end use for gellant-grade attapulgitite-type fuller's earth was miscellaneous fillers, extenders, and binders, followed by, in decreasing order of tonnage, animal feed; adhesives; drilling mud; and filtering, clarifying, and decolorizing applications. Montmorillonite dominated sales to most fuller's earth markets, but attapulgitite accounted for all sales of fuller's earth for adhesives, drilling mud, fertilizers, paint, and plastics.

Domestic sales of U.S. fuller's earth for absorbents increased by 5% in 2014 compared with those in the prior year, and sales of fillers, extenders, and binders decreased by 34% (table 7). Data for filtering, clarifying, and decolorizing of animal, mineral, and vegetable oils and greases could not be revealed in order to protect company proprietary data. However, sales for this application fell compared with those in 2013, consistent with a report from one major producer of decreased U.S.

demand for fluid filtration products (Oil-Dri Corp. of America, 2015, p. 26).

**Prices.**—In 2014, ex-works unit values for U.S. operations of montmorillonite-type fuller's earth ranged from \$2 to \$293 per ton, with the bulk of the values varying from \$40 to \$200 per ton. The average value was \$86 per ton in 2014 compared with \$88 per ton in 2013 (table 7). The average unit value of attapulgitite-type fuller's earth was withheld to avoid disclosing company proprietary data but decreased from that of 2013. The average f.a.s. value of exported fuller's earth was \$379 per ton in 2014 and \$338 per ton in 2013 (table 13), and the average customs value of imported fuller's earth was \$46 per ton in 2014, down from \$54 per ton in 2013 (table 14). At yearend 2014, approximate ex-works prices for soda-ash-treated fuller's earth from South Africa were as follows: civil-engineering grade, \$78 to \$109 per ton; pet waste absorbent grade, \$42 to \$63 per ton; and foundry grade, \$94 to \$133 per ton (Syrett, 2015).

**Foreign Trade.**—Exports of fuller's earth increased to 92,000 t valued at \$34.9 million in 2014 from 86,000 t valued at \$29.1 million during the previous year. Italy, the Netherlands, and Colombia were the primary destinations for U.S. exports, collectively receiving 29% of the total tonnage (table 13). The remainder of the exports was distributed among more than 70 other countries. Imports of decolorizing earths and fuller's earth originated from China (84%) and Japan (16%) and dropped from 8,000 t valued at \$434,000 in 2013 to 4,000 t valued at \$183,000 in 2014 (table 14). A decrease in Chinese imports accounted for 98% of the decline.

### Kaolin

**Production.**—Sixteen companies mined kaolin in nine States during 2014. Domestic production (sold or used by producers) rose by 2% to 6.25 Mt valued at \$901 million from 6.14 Mt valued at \$896 million in 2013 (table 8). U.S. output of kaolin increased by 5% from that in 2010, when 5.95 Mt valued at \$817 million was produced (Virta, 2013, p. 18.12). In 2014, kaolin production accounted for 24% of all clays produced in the United States by quantity and 57% by value (excluding attapulgitite). Sales from Georgia represented 91% of the U.S. kaolin sales tonnage and South Carolina accounted for 6%, followed by, in descending order of tonnage, Alabama, Arkansas, Texas, Nevada, Florida, North Carolina, and California. Sales from Georgia increased slightly to 5.66 Mt valued at \$853 million in 2014 compared with 5.58 Mt valued at \$852 million in 2013, and sales from South Carolina rose to 345,000 t valued at \$30.2 million from 313,000 t valued at \$27.1 million in 2013, an increase in quantity of 10%. Production of kaolin in all other States collectively fell by 3,000 t. Water-washed kaolin represented 38% of all kaolin sold in 2014, followed by, in descending order of tonnage, calcined, 21%; airfloat, 19%; delaminated, 13%; and unprocessed, 8%.

**Consumption.**—Paper coating was the predominant end use for kaolin, with domestic and export sales representing 20% and 21% of total sales, respectively (table 11). The domestic industries for refractory products (10%), miscellaneous ceramics (9%), fiberglass and mineral wool (6%), rubber, paint, and oil

and gas refining catalysts (4% each), heavy-clay products (2%), and paper filling (not listed in order, percentage withheld to avoid disclosing company proprietary data) were also important consumers of kaolin. Smaller but significant markets included floor and wall tile, plastics, and sanitaryware. Lightweight ceramic proppants for use in hydraulic fracturing are also a significant market for kaolin (Hughes, 2015), but available data are insufficient for a reliable estimate of the market size.

The end-use distribution for kaolin producers in Georgia was similar to the market distribution for all States (table 9). The sales rankings for South Carolina operations were, in descending order of tonnage, rubber (39% of sales), ceramics (34%), and other uses including common brick, paper coating, paint, portland cement, plastics, adhesives, and animal feed (27%, combined). Much of the data for individual markets were aggregated in order to avoid disclosing company proprietary data (table 10).

Sales to the domestic paper coating industry in 2014 fell by 175,000 t (12%) relative to 2013 (table 11), continuing a trend that has been ongoing since the late 1990s. In contrast, export sales to international paper coating markets increased by 15% to 1.32 Mt from 1.15 Mt in 2013. The rubber industry saw decreased sales of 266,000 t in 2014, down by 22% from 343,000 t in 2013, and paint sales declined by 28,000 t (10%). Most of the other markets serviced by kaolin producers remained relatively steady (changes of about 5% or less).

**Prices.**—The average unit value (free on board mine or plant) of domestic kaolin in 2014 decreased slightly to \$144 per ton for all kaolin types compared with \$146 per ton in 2013 (table 8). Unit values for individual operations exhibited a high degree of variability, with prices ranging from \$5 to \$520 per ton. The average unit value for airfloat was \$90 per ton in 2014 and 2013; calcined, \$207 per ton in 2014, down slightly from \$208 per ton in 2013; delaminated, \$167 per ton in 2014, up from \$150 per ton in 2013; unprocessed, \$40 per ton in 2014 and \$35 per ton in 2013; and water-washed, \$151 per ton in 2014 compared with \$158 per ton in 2013. The average f.a.s. value of exported kaolin was \$226 per ton in 2014, a slight decline from \$227 per ton in 2013 (table 13), and the average customs value of imported kaolin was \$105 per ton, down from \$120 per ton in 2013 (table 14). At yearend 2014, the ex-works price of number 1 and number 2 paper coating grades of kaolin from a plant in Georgia ranged from \$151 to \$209 per ton and from \$130 to \$204 per ton, respectively (Syrett, 2015).

**Foreign Trade.**—Kaolin exports rose by 4% in 2014 to 2.64 Mt valued at \$596 million from 2.54 Mt valued at \$577 million in 2013 (table 13), consistent with an increase in exports reported by the USGS (table 11). Japan received 17% of the U.S. export tonnage, followed by Mexico (15%), China (13%), Finland (9%), and Canada (8%). There was a discrepancy between exports reported by the USGS (2 Mt) and the U.S. Census Bureau because some exports of kaolin appear to have been shipped under the HTS codes for ball clay or fire clay and because some of the kaolin exported to Canada and Mexico probably was reported by U.S. companies under domestic consumption. Sales through U.S. mineral brokers, where producers do not know if the kaolin is exported or used domestically, could also explain part of the difference. Imports of kaolin totaled 518,000 t valued at

\$54.4 million in 2014, an increase of 11% from 467,000 t valued at \$56 million in 2013 (table 14). About 97% of the imported kaolin originated in Brazil.

## World Review

In 2014, world production of bentonite was 16.8 Mt, a 4% increase from 16.1 Mt in 2013 (table 15). Global fuller's earth output decreased by 3% to 3.35 Mt from 3.45 Mt during the previous year (table 16), and approximately 36.5 Mt of kaolin was produced worldwide, up by 7% compared with 34 Mt (table 17). In 2010, global production of bentonite was 15.8 Mt (6% lower than that in 2014), output of fuller's earth was 3.4 Mt (1% higher), and production of kaolin was 30.9 Mt (16% lower). Kaolin production totals for some countries included ball clay and crude kaolin ore. After accounting for processing losses and the inclusion of ball clay production as kaolin, world sales of processed kaolin in 2014 were estimated to be about 27 Mt. Considering processed clay for sale only, the United States continued to be the leading supplier of all three clay types, followed by India, Turkey, and Greece for bentonite; Spain, Mexico, and Senegal for fuller's earth; and Germany and Brazil for kaolin. Reliable production data for China were not available, but China was also thought to be among the leading producers of bentonite and kaolin. Of the less common types of fuller's earth, Spain led all countries in the production of sepiolite, and Senegal and the United States were the two leading producers of palygorskite (attapulgitite).

## Outlook

Domestic construction activity has been on an upward trajectory during the past 5 years. Housing starts in the United States increased each year since 2010 (U.S. Census Bureau, 2015c), and domestic construction spending (private and public residential and nonresidential spending) increased in every year since 2011 (U.S. Census Bureau, 2015b). Annual domestic shipments of ceramic tile have also risen since 2010 (Whitmire, 2015), and one of the world's leading brick producers expected U.S. residential construction to increase by 9% in 2015, leading to an elevated demand for bricks (Wienerberger AG, 2015, p. 106). These trends indicate that sales of ball clay and common clay will likely increase in 2015.

The American Pet Products Association estimated that domestic consumer spending on pets will increase by more than 4% in 2015 (American Pet Products Association, 2015). Sales of fuller's earth, which primarily services the pet waste absorbent market, and bentonite will likely benefit if this forecast proves to be accurate. Sales of bentonite also are strongly linked to the oil and gas industry owing to its use in drilling mud for rotary systems. The U.S. Energy Information Administration (2015) reported that the domestic oil rig count declined by 60% in early 2015 compared with that of late 2014 and that U.S. crude oil production began to decrease in the second quarter of 2015. The agency expected output of crude oil to continue to fall through most of 2016. The mixed outlooks for the major bentonite markets suggest that sales may remain relatively unchanged in 2015.

Sales of kaolin to the domestic paper industry have steadily decreased since the late 1990s. This trend will likely continue



as more information exchange is conducted electronically, paper recycling rates continue to rise, and calcium carbonate increasingly replaces kaolin in paper filling and coating markets. Lightweight ceramic proppants for use in hydraulic fracturing have also become a significant market for kaolin, and sales to this industry will likely decrease in 2015 as a result of declining oil and gas drilling activity. In contrast, kaolin use in construction and refractory products is likely to grow in 2015 owing to the positive outlook for the construction industry and the fact that demand for refractory products is predicted to increase through 2016 (Brooks, 2013). Overall, U.S. sales of kaolin are expected to fall in 2015 as decreased sales to paper and oil drilling markets outpace increases in sales of refractories and construction products.

## References Cited

- American Pet Products Association, 2015, Pet industry spending at all-time high: Orlando, FL, American Pet Products Association press release, March 6. (Accessed October 30, 2015, at <http://media.americanpetproducts.org/press.php?include=145554>.)
- Baker Hughes Inc., 2015, Rig count overview & summary count: Houston, TX, Baker Hughes Inc. (Accessed October 30, 2015, via <http://phx.corporate-ir.net/phoenix.zhtml?c=79687&p=irol-rigcountoverview>.)
- Boral Ltd., 2015, Boral Limited annual report for the year ended 30 June 2015: North Sydney, New South Wales, Australia, Boral Ltd., 133 p. (Accessed October 30, 2015, at <http://www.boral.com/Images/common/pdfs/annual-reports/Boral-Annual-Report-2015.pdf>.)
- Brooks, Robert, 2013, Refractory demand shows patterns of industrial growth: Cleveland, OH, Foundry Management and Technology, May 16. (Accessed November 6, 2015, at <http://foundrymag.com/meltpour/refractory-demand-shows-patterns-industrial-growth>.)
- Carter, Ted, 2014, Cherokee Brick & Tile to restart Tri-State plant in Jackson: [Jackson] Mississippi Business Journal, July 7. (Accessed August 26, 2014, at <http://msbusiness.com/2014/07/cherokee-brick-tile-restart-tri-state-plant-jackson/>.)
- Choudhury, Nilima, 2014, Improved logistics to come to US bentonite hub: London, United Kingdom, Industrial Minerals, May 12. (Accessed May 16, 2014, via <http://www.indmin.com>.)
- Hughes, Emma, 2015, Ceramic challenge—Why synthetic proppants have it tough: London, United Kingdom, Industrial Minerals, March 20. (Accessed December 28, 2015, via <http://www.indmin.com>.)
- Imerys S.A., 2015, 2014 annual financial report: Paris, France, Imerys S.A., 324 p. (Accessed November 9, 2015, via <http://www.imerys.com/Scopi/Group/imeryscom/imeryscom.nsf/pagesref/SCOI-8S4EYJ?opendocument&lang=en&publi=5>.)
- Minerals Technologies Inc., 2014, Minerals Technologies completes acquisition of AMCOL International: New York, NY, Minerals Technologies Inc. press release, May 9. (Accessed November 9, 2015, at <http://phx.corporate-ir.net/phoenix.zhtml?c=82665&p=irol-newsArticle&id=1929432>.)
- Oil-Dri Corp. of America, 2015, Form 10-K for the fiscal year ended July 31, 2015: U.S. Securities and Exchange Commission, October 9, 80 p. (Accessed November 6, 2015, at <http://www.sec.gov/Archives/edgar/data/74046/000007404615000043/odc10k7312015.htm>.)
- Syrett, Laura, 2015, IM January price movements: London, United Kingdom, Industrial Minerals, January 5. (Accessed November 6, 2015, via <http://www.indmin.com>.)

- U.S. Census Bureau, 2015a, Advance report on durable goods manufacturers' shipments, inventories and orders December 2014: Washington, DC, U.S. Census Bureau news release, January 27, 4 p. (Accessed November 6, 2015, at [http://www.census.gov/manufacturing/m3/historical\\_data/pressreleases/adv/2014/dec14adv.pdf](http://www.census.gov/manufacturing/m3/historical_data/pressreleases/adv/2014/dec14adv.pdf).)
- U.S. Census Bureau, 2015b, Annual value of construction put in place 2008–2014: Washington, DC, U.S. Census Bureau. (Accessed October 30, 2015, via [http://www.census.gov/construction/c30/historical\\_data.html](http://www.census.gov/construction/c30/historical_data.html).)
- U.S. Census Bureau, 2015c, New residential construction: Washington, DC, U.S. Census Bureau. (Accessed October 30, 2015, via [http://www.census.gov/construction/nrc/historical\\_data/index.html](http://www.census.gov/construction/nrc/historical_data/index.html).)
- U.S. Energy Information Administration, 2015, Short-term energy and winter fuels outlook: Washington, DC, U.S. Energy Information Administration press release, October 6. (Accessed November 4, 2015, at [http://www.eia.gov/forecasts/steo/report/us\\_oil.cfm](http://www.eia.gov/forecasts/steo/report/us_oil.cfm).)
- van Oss, H.G., 2015, Cement in December 2014: U.S. Geological Survey Mineral Industry Surveys, April, 32 p. (Accessed October 30, 2015, at <http://minerals.usgs.gov/minerals/pubs/commodity/cement/mis-201412-cemen.pdf>.)
- Virta, R.L., 2007, Clay and shale, in *Metals and minerals: U.S. Geological Survey Minerals Yearbook 2005*, v. I, p. 18.1–18.24. (Accessed October 30, 2015, at <https://minerals.usgs.gov/minerals/pubs/commodity/clays/claysmyb05.pdf>.)
- Virta, R.L., 2013, Clay and shale, in *Metals and minerals: U.S. Geological Survey Minerals Yearbook 2011*, v. I, p. 18.1–18.20. (Accessed October 30, 2015, at <https://minerals.usgs.gov/minerals/pubs/commodity/clays/myb1-2011-clays.pdf>.)
- Whitmire, Andrew, 2015, 2014 ceramic tile industry update: Anderson, SC, Tile Council of North America Inc. press release, April 13, 9 p. (Accessed October 30, 2015, at [http://www.tcnatile.com/images/pdfs/2014\\_US\\_Ceramic\\_Tile\\_Industry\\_Update.pdf](http://www.tcnatile.com/images/pdfs/2014_US_Ceramic_Tile_Industry_Update.pdf).)
- Wienerberger AG, 2015, Annual report 2014: Vienna, Austria, Wienerberger AG, 202 p. (Accessed October 30, 2015, via <http://www.wienerberger.com>.)

## GENERAL SOURCES OF INFORMATION

### U.S. Geological Survey Publications

- Clays. Ch. in *Mineral Commodity Summaries*, annual.
- Clays. Ch. in *United States Mineral Resources*, Professional Paper 820, 1973.
- Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.

### Other

- Bentonite. *Global Industry Markets and Outlook* (12th ed.), Roskill Information Services, 2015.
- Clays. Ch. in *Industrial Minerals and Rocks* (7th ed.), Society for Mining, Metallurgy, and Exploration, 2006.
- Clays. Ch. in *Mineral Facts and Problems*, U.S. Bureau of Mines Bulletin 675, 1985.
- Kaolin. *Global Industry Markets and Outlook* (13th ed.), Roskill Information Services, 2013.



TABLE 1  
SALIENT U.S. CLAY STATISTICS<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

|   | 2010      | 2011      | 2012                   | 2013                   | 2014      |
|---|-----------|-----------|------------------------|------------------------|-----------|
| Domestic clays sold or used by producers: |           |           |                        |                        |           |
| Quantity                                  | 25,600    | 25,700    | 25,800 <sup>r</sup>    | 24,700 <sup>r</sup>    | 25,900    |
| Value                                     | 1,480,000 | 1,540,000 | 1,540,000 <sup>r</sup> | 1,530,000 <sup>r</sup> | 1,580,000 |
| Exports:                                  |           |           |                        |                        |           |
| Quantity                                  | 4,360     | 4,240     | 4,270                  | 4,140                  | 4,190     |
| Value                                     | 862,000   | 988,000   | 870,000                | 892,000                | 942,000   |
| Imports for consumption:                  |           |           |                        |                        |           |
| Quantity                                  | 555       | 593       | 524                    | 518 <sup>r</sup>       | 576       |
| Value                                     | 81,200    | 97,400    | 108,000                | 86,900 <sup>r</sup>    | 96,900    |

<sup>r</sup>Revised.

<sup>1</sup>Excludes Puerto Rico.

<sup>2</sup>Data are rounded to no more than three significant digits.

TABLE 2  
CLAYS SOLD OR USED BY PRODUCERS IN THE  
UNITED STATES, BY STATE<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

| State <sup>3</sup>                       | 2013                |                        | 2014     |           |
|--|---------------------|------------------------|----------|-----------|
|  | Quantity            | Value                  | Quantity | Value     |
| Alabama                                  | 1,380 <sup>r</sup>  | 20,500 <sup>r</sup>    | 1,480    | 23,200    |
| Arizona, New Mexico, and Utah            | 439                 | 8,460                  | 344      | 6,670     |
| Arkansas, Louisiana, and Mississippi     | 1,150 <sup>r</sup>  | 42,200 <sup>r</sup>    | 1,210    | 42,900    |
| California, Oregon, and Washington       | 1,420               | 39,000                 | 1,500    | 42,700    |
| Colorado and Nevada                      | 223                 | 6,190                  | 205      | 6,310     |
| Georgia                                  | 6,510 <sup>r</sup>  | 899,000 <sup>r</sup>   | 6,540    | 898,000   |
| Illinois and Iowa                        | 149                 | 2,580                  | 219      | 6,580     |
| Indiana                                  | 325                 | 8,140                  | 314      | 8,160     |
| Kansas                                   | 342 <sup>r</sup>    | 3,090 <sup>r</sup>     | 397      | 3,190     |
| Kentucky and Tennessee                   | 1,010 <sup>r</sup>  | 41,200 <sup>r</sup>    | 1,030    | 39,300    |
| Maryland, Virginia, and West Virginia    | 652                 | 24,700                 | 845      | 28,900    |
| Missouri                                 | 1,030               | 34,400 <sup>r</sup>    | 1,090    | 34,900    |
| Montana and Wyoming                      | 4,070               | 256,000                | 4,500    | 300,000   |
| Nebraska, North Dakota, and South Dakota | 258                 | 1,380                  | 259      | 1,270     |
| New York                                 | 548 <sup>r</sup>    | 24,900 <sup>r</sup>    | 513      | 22,200    |
| North Carolina                           | 738                 | 20,400                 | 808      | 17,900    |
| Ohio                                     | 602 <sup>r</sup>    | 9,100 <sup>r</sup>     | 643      | 9,980     |
| Oklahoma                                 | 925 <sup>r</sup>    | 3,160 <sup>r</sup>     | 906      | 3,020     |
| Pennsylvania                             | 236                 | 2,150 <sup>r</sup>     | 229      | 2,070     |
| South Carolina                           | 457 <sup>r</sup>    | 28,000 <sup>r</sup>    | 501      | 31,100    |
| Texas                                    | 1,870               | 38,000                 | 2,090    | 44,200    |
| Other <sup>4</sup>                       | 344 <sup>r</sup>    | 15,900 <sup>r</sup>    | 229      | 4,380     |
| Total                                    | 24,700 <sup>r</sup> | 1,530,000 <sup>r</sup> | 25,900   | 1,580,000 |

<sup>r</sup>Revised.

<sup>1</sup>Excludes Puerto Rico and attapulgite production.

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>Publishable totals used to avoid disclosing company proprietary data.

<sup>4</sup>Includes Connecticut, Florida, Massachusetts, Michigan, and Minnesota.

TABLE 3  
BALL CLAY SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY TYPE AND USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Type and use                                 | 2013         |               | 2014         |               |
|--|--------------|---------------|--------------|---------------|
|  | Quantity     | Value         | Quantity     | Value         |
| <b>Type:</b>                                 |              |               |              |               |
| Airfloat                                     | 697          | 27,500        | 668          | 27,900        |
| Water-slurried and unprocessed               | 306          | 15,200        | 365          | 17,300        |
| <b>Total</b>                                 | <b>1,000</b> | <b>42,800</b> | <b>1,030</b> | <b>45,200</b> |
| <b>Use:</b>                                  |              |               |              |               |
| Fillers, extenders, and binders <sup>2</sup> | 34           | NA            | 38           | NA            |
| Floor and wall tile                          | 395          | NA            | 422          | NA            |
| Miscellaneous ceramics <sup>3</sup>          | 88           | NA            | 272          | NA            |
| Pottery                                      | 3            | NA            | W            | NA            |
| Sanitaryware                                 | 170          | NA            | W            | NA            |
| Miscellaneous <sup>4</sup>                   | 142          | NA            | 163          | NA            |
| Exports, reported by producers <sup>5</sup>  | 171          | NA            | 138          | NA            |
| <b>Total</b>                                 | <b>1,000</b> | <b>42,800</b> | <b>1,030</b> | <b>45,200</b> |

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

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

<sup>2</sup>Includes adhesives; animal feed; asphalt emulsions; fertilizer carriers; paint; rubber; and other fillers, extenders, and binders.

<sup>3</sup>Includes catalysts (oil-refining), dinnerware and fine china, electrical porcelain, fiberglass, mineral wool, and roofing granules.

<sup>4</sup>Includes chemical manufacturing, heavy-clay products, refractories, and unknown uses.

<sup>5</sup>Includes miscellaneous ceramics and unknown uses.

TABLE 4  
BENTONITE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY TYPE AND USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Type and use                                  | 2013             |                | 2014         |                |
|---|------------------|----------------|--------------|----------------|
|   | Quantity         | Value          | Quantity     | Value          |
| <b>Type:</b>                                  |                  |                |              |                |
| Nonswelling                                   | 132              | 9,960          | 156          | 11,200         |
| Swelling                                      | 4,220            | 272,000        | 4,650        | 318,000        |
| <b>Total</b>                                  | <b>4,350</b>     | <b>282,000</b> | <b>4,800</b> | <b>329,000</b> |
| <b>Use:</b>                                   |                  |                |              |                |
| <b>Domestic:</b>                              |                  |                |              |                |
| Pet waste absorbents                          | 1,130            | NA             | 1,390        | NA             |
| Adhesives                                     | 10               | NA             | W            | NA             |
| Animal feed                                   | 84               | NA             | 79           | NA             |
| Drilling mud                                  | 932              | NA             | 1,240        | NA             |
| Filler and extender applications <sup>2</sup> | 64               | NA             | 36           | NA             |
| Foundry sand                                  | 440              | NA             | W            | NA             |
| Pelletizing (iron ore)                        | 470              | NA             | W            | NA             |
| Waterproofing and sealing                     | 125 <sup>r</sup> | NA             | 92           | NA             |
| Miscellaneous civil engineering <sup>3</sup>  | 158 <sup>r</sup> | NA             | 111          | NA             |
| Miscellaneous <sup>4</sup>                    | 110 <sup>r</sup> | NA             | 922          | NA             |
| <b>Total</b>                                  | <b>3,520</b>     | <b>NA</b>      | <b>3,860</b> | <b>NA</b>      |
| <b>Exports, reported by producers:</b>        |                  |                |              |                |
| Drilling mud                                  | 132              | NA             | (5)          | NA             |
| Foundry sand                                  | 201              | NA             | (5)          | NA             |
| Other <sup>6</sup>                            | 500              | NA             | 940          | NA             |
| <b>Total</b>                                  | <b>833</b>       | <b>NA</b>      | <b>940</b>   | <b>NA</b>      |
| <b>Grand total</b>                            | <b>4,350</b>     | <b>282,000</b> | <b>4,800</b> | <b>329,000</b> |

<sup>r</sup>Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Miscellaneous."

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

<sup>2</sup>Includes asphalt emulsions, asphalt tiles, cosmetics, fertilizers, ink, medical, miscellaneous filler and extender applications, paint, paper coating, paper filling, pesticides and related products, pharmaceuticals, and plastics.

<sup>3</sup>Includes water treatment and filtering and other civil engineering applications.

<sup>4</sup>Includes ceramics, chemical manufacturing, clarifying and decolorizing, heavy-clay products, oil and grease absorbents, refractories, and unknown uses.

<sup>5</sup>Withheld to avoid disclosing company proprietary data; included in "Other."

<sup>6</sup>Includes absorbents, fillers and extenders, iron ore pelletizing, refractories, and unknown uses.



TABLE 5  
COMMON CLAY AND SHALE SOLD OR USED BY PRODUCERS  
IN THE UNITED STATES, BY STATE AND USE<sup>1,2,3</sup>

(Thousand metric tons and thousand dollars)

| State and use                            | 2013                      |                            | 2014          |                |
|--|---------------------------|----------------------------|---------------|----------------|
|  | Quantity                  | Value                      | Quantity      | Value          |
| <b>State:</b>                            |                           |                            |               |                |
| Alabama                                  | 1,190 <sup>r</sup>        | 8,630 <sup>r</sup>         | 1,260         | 9,140          |
| Arizona, New Mexico, and Utah            | 317                       | 7,020                      | 229           | 4,590          |
| Arkansas, Louisiana, and Mississippi     | 696 <sup>r</sup>          | 4,190 <sup>r</sup>         | 778           | 4,970          |
| California and Oregon                    | 1,170                     | 8,540                      | 1,240         | 13,000         |
| Colorado                                 | 187 <sup>r</sup>          | 4,820 <sup>r</sup>         | 179           | 4,510          |
| Georgia and South Carolina               | 586                       | 2,080                      | 505           | 1,890          |
| Illinois, Iowa, and Missouri             | 477                       | 3,380                      | 522           | 3,520          |
| Indiana                                  | 294                       | 6,490                      | 287           | 6,510          |
| Kansas                                   | 309                       | 1,800                      | 364           | 1,860          |
| Kentucky and Tennessee                   | 279 <sup>r</sup>          | 5,610 <sup>r</sup>         | 280           | 5,180          |
| Maryland, Virginia, and West Virginia    | 391                       | 1,380                      | 550           | 1,810          |
| Montana and Wyoming                      | 67                        | 63                         | 72            | 65             |
| Nebraska, North Dakota, and South Dakota | 258                       | 1,380                      | 259           | 1,270          |
| New York                                 | 548 <sup>r</sup>          | 24,900 <sup>r</sup>        | 513           | 22,200         |
| North Carolina                           | 727                       | 20,000                     | 799           | 17,500         |
| Ohio                                     | 602 <sup>r</sup>          | 9,100 <sup>r</sup>         | 643           | 9,980          |
| Oklahoma                                 | 925 <sup>r</sup>          | 3,160 <sup>r</sup>         | 906           | 3,020          |
| Pennsylvania                             | 236                       | 2,150 <sup>r</sup>         | 229           | 2,070          |
| Texas                                    | 1,520                     | 12,100                     | 1,740         | 14,400         |
| Other <sup>4</sup>                       | 237 <sup>r</sup>          | 1,750 <sup>r</sup>         | 216           | 1,530          |
| <b>Total</b>                             | <b>11,000<sup>r</sup></b> | <b>128,000<sup>r</sup></b> | <b>11,600</b> | <b>129,000</b> |
| <b>Use:</b>                              |                           |                            |               |                |
| Floor and wall tile <sup>5</sup>         | 191 <sup>r</sup>          | NA                         | 370           | NA             |
| <b>Heavy-clay products:</b>              |                           |                            |               |                |
| Brick, extruded                          | 4,260 <sup>r</sup>        | NA                         | 4,300         | NA             |
| Brick, other                             | 327 <sup>r</sup>          | NA                         | 537           | NA             |
| Other <sup>6</sup>                       | 21                        | NA                         | 20            | NA             |
| <b>Lightweight aggregate:</b>            |                           |                            |               |                |
| Concrete block                           | 963 <sup>r</sup>          | NA                         | 1,020         | NA             |
| Highway surfacing                        | 274 <sup>r</sup>          | NA                         | 303           | NA             |
| Structural concrete                      | 510 <sup>r</sup>          | NA                         | 678           | NA             |
| Miscellaneous                            | 694 <sup>r</sup>          | NA                         | 555           | NA             |
| Portland and other cements               | 3,270                     | NA                         | 3,340         | NA             |
| Refractories <sup>7</sup>                | 95                        | NA                         | 83            | NA             |
| Miscellaneous <sup>8</sup>               | 409 <sup>r</sup>          | NA                         | 376           | NA             |
| <b>Total</b>                             | <b>11,000<sup>r</sup></b> | <b>128,000<sup>r</sup></b> | <b>11,600</b> | <b>129,000</b> |

<sup>r</sup>Revised. NA Not available.

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

<sup>2</sup>Excludes Puerto Rico.

<sup>3</sup>Includes only production for companies with mills or plants.

<sup>4</sup>Includes Connecticut, Massachusetts, Michigan, and Minnesota.

<sup>5</sup>Includes ceramic tile, quarry tile, and miscellaneous floor and wall tiles.

<sup>6</sup>Includes drain tile, flowerpots, flue linings, sewer pipes, structural tile, and miscellaneous heavy-clay products.

<sup>7</sup>Includes block and shapes, firebrick, grogs and calcines, mortar and cement, and miscellaneous refractories.

<sup>8</sup>Includes exports reported by producers; miscellaneous civil engineering and sealings; miscellaneous fillers, extenders, and binders; pottery; roofing granules; and unknown uses.

TABLE 6  
FIRE CLAY SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Use   | 2013             |                    | 2014     |       |
|---|------------------|--------------------|----------|-------|
|   | Quantity         | Value              | Quantity | Value |
| Heavy-clay products and lightweight aggregates <sup>2</sup> | 51               | NA                 | 111      | NA    |
| Refractories:   |                  |                    |          |       |
| Firebrick, block, and shapes                                | W                | NA                 | W        | NA    |
| Groggs and calcines   | W                | NA                 | W        | NA    |
| Other refractories <sup>3</sup>                             | W                | NA                 | W        | NA    |
| Miscellaneous <sup>4</sup>                                  | 143 <sup>r</sup> | NA                 | 111      | NA    |
| Total   | 194 <sup>r</sup> | 3,460 <sup>r</sup> | 222      | 3,880 |

<sup>1</sup>Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Miscellaneous."

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>Includes common brick, concrete block, portland cement, and structural concrete.

<sup>4</sup>Includes kiln furniture, mortar and cement, and miscellaneous refractories.

<sup>5</sup>Includes floor tile, pottery, wall tile, miscellaneous ceramics, and unknown uses.

TABLE 7  
FULLER'S EARTH SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY TYPE AND USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Type and use   | 2013             |                      | 2014     |         |
|--|------------------|----------------------|----------|---------|
|  | Quantity         | Value                | Quantity | Value   |
| Type:  |                  |                      |          |         |
| Attapulgite  | (2)              | (2)                  | (2)      | (2)     |
| Montmorillonite                                      | 1,990            | 175,000 <sup>r</sup> | 1,980    | 169,000 |
| Total  | 1,990            | 175,000 <sup>r</sup> | 1,980    | 169,000 |
| Use:   |                  |                      |          |         |
| Absorbents <sup>3</sup>                              | 1,420            | NA                   | 1,480    | NA      |
| Animal feed  | 19               | NA                   | 58       | NA      |
| Fillers, extenders, and binders <sup>4</sup>         | 152              | NA                   | 100      | NA      |
| Filtering, clarifying, and decolorizing <sup>5</sup> | 151              | NA                   | W        | NA      |
| Miscellaneous <sup>6</sup>                           | 183 <sup>r</sup> | NA                   | 310      | NA      |
| Exports, reported by producers <sup>7</sup>          | 65               | NA                   | 31       | NA      |
| Total  | 1,990            | 175,000 <sup>r</sup> | 1,980    | 169,000 |

<sup>1</sup>Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; included in "Miscellaneous."

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>Withheld to avoid disclosing company proprietary data. Primarily gellant-grade fuller's earth. More information can be found in the "Fuller's Earth" section of this report.

<sup>4</sup>Includes oil and grease absorbents, pet waste absorbents, and miscellaneous absorbents.

<sup>5</sup>Includes asphalt emulsions; medical, pharmaceuticals, and cosmetics; paints; pesticides and related products; and miscellaneous filler, extender, and binder applications.

<sup>6</sup>Includes mineral and vegetable oils and greases.

<sup>7</sup>Includes civil engineering, drilling mud, and unknown uses.

<sup>8</sup>Includes drilling mud, oil and grease absorbents, paint, pet waste absorbents, and unknown uses.

TABLE 8  
KAOLIN SOLD OR USED BY PRODUCERS IN THE UNITED STATES,  
BY STATE AND TYPE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| State and type        | 2013                      |                             | 2014         |                |
|-----------------------|---------------------------|-----------------------------|--------------|----------------|
|                       | Quantity                  | Value                       | Quantity     | Value          |
| <b>State:</b>         |                           |                             |              |                |
| Georgia               | 5,580 <sup>r</sup>        | 852,000 <sup>r</sup>        | 5,660        | 853,000        |
| South Carolina        | 313 <sup>r</sup>          | 27,100 <sup>r</sup>         | 345          | 30,200         |
| Other <sup>2</sup>    | 243 <sup>r</sup>          | 16,600                      | 240          | 17,700         |
| <b>Total</b>          | <b>6,140 <sup>r</sup></b> | <b>896,000 <sup>r</sup></b> | <b>6,250</b> | <b>901,000</b> |
| <b>Type:</b>          |                           |                             |              |                |
| Airfloat              | 1,190 <sup>r</sup>        | 107,000 <sup>r</sup>        | 1,180        | 106,000        |
| Calcined <sup>3</sup> | 1,330                     | 275,000                     | 1,310        | 272,000        |
| Delaminated           | 926                       | 139,000                     | 836          | 140,000        |
| Unprocessed           | 423                       | 14,900                      | 520          | 20,700         |
| Water washed          | 2,270                     | 360,000                     | 2,400        | 362,000        |
| <b>Total</b>          | <b>6,140 <sup>r</sup></b> | <b>896,000 <sup>r</sup></b> | <b>6,250</b> | <b>901,000</b> |

<sup>r</sup>Revised.

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

<sup>2</sup>Includes Alabama, Arkansas, California, Florida, Nevada, North Carolina, and Texas.

<sup>3</sup>Includes pigment-grade kaolin (low-temperature calcined kaolin) and refractory-grade kaolin (high-temperature calcined kaolin).



TABLE 9  
 GEORGIA KAOLIN SOLD OR USED BY PRODUCERS, BY TYPE AND USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Type and use                     | 2013               |                      | 2014     |         |
|----------------------------------|--------------------|----------------------|----------|---------|
|                                  | Quantity           | Value                | Quantity | Value   |
| Type:                            |                    |                      |          |         |
| Airfloat                         | 883 <sup>r</sup>   | 77,100 <sup>r</sup>  | 841      | 73,700  |
| Calcined <sup>2</sup>            | 1,270              | 268,000              | 1,260    | 263,000 |
| Delaminated                      | 926                | 139,000              | 836      | 140,000 |
| Unprocessed                      | 251                | 9,400                | 336      | 14,400  |
| Water washed                     | 2,250              | 360,000              | 2,390    | 362,000 |
| Total                            | 5,580 <sup>r</sup> | 852,000 <sup>r</sup> | 5,660    | 853,000 |
| Use:                             |                    |                      |          |         |
| Domestic:                        |                    |                      |          |         |
| Ceramics:                        |                    |                      |          |         |
| Catalysts (oil-refining)         | W                  | NA                   | W        | NA      |
| Fiberglass, mineral wool         | 295 <sup>r</sup>   | NA                   | 289      | NA      |
| Roofing granules                 | W                  | NA                   | W        | NA      |
| Other <sup>3</sup>               | 604 <sup>r</sup>   | NA                   | 769      | NA      |
| Fillers, extenders, and binders: |                    |                      |          |         |
| Adhesives                        | 37                 | NA                   | 23       | NA      |
| Paint                            | 267                | NA                   | 238      | NA      |
| Paper coating                    | 1,400              | NA                   | 1,230    | NA      |
| Paper filling                    | W                  | NA                   | W        | NA      |
| Plastic                          | 59                 | NA                   | 49       | NA      |
| Rubber                           | 178 <sup>r</sup>   | NA                   | 139      | NA      |
| Other <sup>4</sup>               | 271 <sup>r</sup>   | NA                   | 259      | NA      |
| Heavy-clay products <sup>5</sup> | (6)                | NA                   | (6)      | NA      |
| Refractories <sup>7</sup>        | (6)                | NA                   | (6)      | NA      |
| Undistributed <sup>8</sup>       | 774 <sup>r</sup>   | NA                   | 676      | NA      |
| Total                            | 3,890 <sup>r</sup> | NA                   | 3,670    | NA      |
| Exports, reported by producers:  |                    |                      |          |         |
| Paint                            | W                  | NA                   | W        | NA      |
| Paper coating <sup>9</sup>       | 1,150              | NA                   | 1,320    | NA      |
| Paper filling <sup>9</sup>       | W                  | NA                   | W        | NA      |
| Rubber                           | 40                 | NA                   | 42       | NA      |
| Undistributed <sup>10</sup>      | 505 <sup>r</sup>   | NA                   | 633      | NA      |
| Total                            | 1,690              | NA                   | 2,000    | NA      |
| Grand total                      | 5,580 <sup>r</sup> | 852,000 <sup>r</sup> | 5,660    | 853,000 |

<sup>r</sup>Revised. NA Not available. W Withheld to avoid disclosing company proprietary data.

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

<sup>2</sup>Includes pigment- and refractory-grade calcined kaolin.

<sup>3</sup>Includes electrical porcelain, fine china and dinnerware, floor and wall tile, pottery, sanitaryware, miscellaneous ceramics, and withheld data under "Domestic: Ceramics."

<sup>4</sup>Includes animal feed; asphalt tile; fertilizers; medical, pharmaceuticals, and cosmetics; pesticides and related products; miscellaneous fillers, extenders, and binders; and withheld data under "Domestic: Fillers, extenders, and binders."

<sup>5</sup>Includes brick (common and face), portland cement, and miscellaneous heavy-clay products.

<sup>6</sup>Withheld to avoid disclosing company proprietary data; included in "Domestic: Undistributed."

<sup>7</sup>Includes block and shapes, firebrick, grogs and calcines, high-alumina specialties, kiln furniture, and miscellaneous refractories.

<sup>8</sup>Includes chemical manufacturing, waterproofing seals, and unknown uses.

<sup>9</sup>Some export sales by producers may be included with domestic sales.

<sup>10</sup>Includes miscellaneous ceramics; miscellaneous fillers, extenders, and binders; unknown uses; and withheld data under "Exports, reported by producers."

TABLE 10  
SOUTH CAROLINA KAOLIN SOLD OR USED BY PRODUCERS, BY USE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Use                       | 2013             |                     | 2014     |        |
|---------------------------|------------------|---------------------|----------|--------|
|                           | Quantity         | Value               | Quantity | Value  |
| Ceramics <sup>2</sup>     | 107              | NA                  | 118      | NA     |
| Rubber (includes exports) | 169 <sup>r</sup> | NA                  | 133      | NA     |
| Other <sup>3</sup>        | 37 <sup>r</sup>  | NA                  | 95       | NA     |
| Total <sup>4</sup>        | 313 <sup>r</sup> | 27,100 <sup>r</sup> | 345      | 30,200 |

<sup>r</sup>Revised. NA Not available.

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

<sup>2</sup>Includes catalysts (oil-refining), fiberglass, roofing granules, and sanitaryware.

<sup>3</sup>Includes adhesives, animal feed, brick (common), floor and wall tile, paint, paper coating, plastics, portland cement, and refractories.

<sup>4</sup>Includes airfloat, calcined, and unprocessed kaolin.

TABLE 11  
KAOLIN SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE<sup>1</sup>

(Thousand metric tons)

| Use                              | 2013               | 2014  |
|----------------------------------|--------------------|-------|
| Domestic:                        |                    |       |
| Ceramics:                        |                    |       |
| Catalyst (oil and gas refining)  | 232 <sup>r</sup>   | 243   |
| Fiberglass, mineral wool         | 341 <sup>r</sup>   | 344   |
| Fine china and dinnerware        | 8                  | 8     |
| Floor and wall tile              | 55                 | 56    |
| Pottery                          | W                  | W     |
| Roofing granules                 | W                  | W     |
| Sanitaryware                     | 60 <sup>r</sup>    | 58    |
| Miscellaneous <sup>2</sup>       | 402 <sup>r</sup>   | 573   |
| Chemical manufacture             | (3)                | (3)   |
| Fillers, extenders, binders:     |                    |       |
| Adhesives                        | 39                 | 25    |
| Paint                            | 287                | 259   |
| Paper coating                    | 1,410              | 1,230 |
| Paper filling                    | W                  | W     |
| Pesticide                        | W                  | W     |
| Plastic                          | 61                 | 51    |
| Rubber                           | 343 <sup>r</sup>   | 266   |
| Miscellaneous <sup>4</sup>       | 271 <sup>r</sup>   | 260   |
| Heavy-clay products <sup>5</sup> | 118                | 111   |
| Refractories <sup>6</sup>        | 609                | 595   |
| Miscellaneous applications       | 193 <sup>r</sup>   | 165   |
| Total                            | 4,430 <sup>r</sup> | 4,250 |
| Exports, reported by producers:  |                    |       |
| Ceramics                         | W                  | W     |
| Paint                            | 125                | W     |
| Paper coating                    | 1,150              | 1,320 |
| Paper filling                    | W                  | W     |
| Rubber                           | 45                 | 48    |
| Unknown uses <sup>7</sup>        | 393                | 634   |
| Total                            | 1,710 <sup>r</sup> | 2,000 |
| Grand total                      | 6,140 <sup>r</sup> | 6,250 |

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data.

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

<sup>2</sup>Includes electrical porcelain, miscellaneous ceramics, and withheld data under "Domestic: Ceramics."

<sup>3</sup>Withheld to avoid disclosing company proprietary data; included in "Domestic: Miscellaneous applications."

<sup>4</sup>Includes animal feed; medical, pharmaceuticals, and cosmetics; miscellaneous fillers, extenders, and binders; and withheld data under "Domestic: Fillers, extenders, binders."

<sup>5</sup>Includes brick (common) and portland and other cements.

<sup>6</sup>Includes block and shapes, firebrick, grogs and calcines, and miscellaneous refractories.

<sup>7</sup>Includes withheld data under "Exports, reported by producers."



TABLE 12  
COMMON CLAY AND SHALE USED IN BUILDING BRICK  
PRODUCTION IN THE UNITED STATES, BY STATE<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

| State                                 | 2013               |                     | 2014     |                    |
|---------------------------------------|--------------------|---------------------|----------|--------------------|
|                                       | Quantity           | Value <sup>c</sup>  | Quantity | Value <sup>c</sup> |
| Alabama                               | 319 <sup>r</sup>   | 3,420 <sup>r</sup>  | 392      | 5,560              |
| Arkansas, Louisiana, and Mississippi  | 343 <sup>r</sup>   | 2,070 <sup>r</sup>  | 436      | 2,920              |
| California, Colorado, and New Mexico  | 137                | 910                 | 154      | 1,010              |
| Georgia and South Carolina            | 578                | 2,030               | 497      | 1,850              |
| Illinois, Iowa, Kansas, and Missouri  | 189                | 1,020               | 204      | 1,060              |
| Indiana                               | 55                 | 293                 | 60       | 328                |
| Kentucky and Tennessee                | 143                | 670                 | 152      | 720                |
| Maryland, Virginia, and West Virginia | 380                | 1,340               | 454      | 1,660              |
| Nebraska and North Dakota             | 121                | 773 <sup>r</sup>    | 134      | 710                |
| North Carolina                        | 455                | 1,960               | 391      | 1,790              |
| Ohio                                  | 305 <sup>r</sup>   | 1,770 <sup>r</sup>  | 327      | 1,830              |
| Oklahoma                              | 740 <sup>r</sup>   | 2,580 <sup>r</sup>  | 711      | 2,410              |
| Pennsylvania                          | 191                | 1,200 <sup>r</sup>  | 188      | 1,220              |
| Texas                                 | 509                | 2,510               | 607      | 3,000              |
| Utah                                  | 22                 | 52                  | 29       | 66                 |
| Wyoming                               | 20                 | 34                  | 21       | 35                 |
| Other <sup>3</sup>                    | 82 <sup>r</sup>    | 868 <sup>r</sup>    | 75       | 719                |
| Total                                 | 4,590 <sup>r</sup> | 23,500 <sup>r</sup> | 4,830    | 26,900             |

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

<sup>1</sup>Includes extruded and other brick.

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>Includes Connecticut, Massachusetts, Michigan, and Minnesota.

TABLE 13  
U.S. EXPORTS OF CLAYS, BY TYPE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Type of clay       | 2013     |         | 2014     |         | Principal destinations in 2014  |
|--------------------|----------|---------|----------|---------|---|
|                    | Quantity | Value   | Quantity | Value   |   |
| Ball clay          | 52       | 6,610   | 33       | 7,530   | Belgium, 14%; Nicaragua, 12%; Guatemala, 11%; Japan, 11%; Costa Rica, 9%. |
| Bentonite          | 890      | 157,000 | 901      | 178,000 | Canada, 47%; Japan, 14%; Saudi Arabia, 8%; China, 6%; Mexico, 5%.         |
| Fire clay          | 268      | 41,100  | 237      | 52,700  | Luxembourg, 28%; Mexico, 26%; Japan, 15%; Taiwan, 9%.                     |
| Fuller's earth     | 86       | 29,100  | 92       | 34,900  | Italy, 12%; Netherlands, 9%; Colombia, 8%.                                |
| Kaolin             | 2,540    | 577,000 | 2,640    | 596,000 | Japan, 17%; Mexico, 15%; China, 13%; Finland, 9%; Canada, 8%.             |
| Clays <sup>2</sup> | 304      | 81,200  | 282      | 72,000  | Canada, 74%; Mexico, 4%.  |
| Total              | 4,140    | 892,000 | 4,190    | 942,000 |   |

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

<sup>2</sup>Not elsewhere classified.

Source: U.S. Census Bureau.

TABLE 14  
U.S. IMPORTS FOR CONSUMPTION OF CLAY, BY TYPE<sup>1</sup>

(Thousand metric tons and thousand dollars)

| Type of clay                          | 2013             |                     | 2014     |        | Principal sources in 2014  |
|---------------------------------------|------------------|---------------------|----------|--------|--|
|                                       | Quantity         | Value               | Quantity | Value  |  |
| Artificially activated clay and earth | 24 <sup>r</sup>  | 14,000 <sup>r</sup> | 26       | 14,000 | Mexico, 88%; China, 6%; Germany, 5%.                                     |
| Ball clay                             | (2)              | 174                 | 1        | 173    | United Kingdom, 76%; Germany, 15%; Australia, 7%.                        |
| Bentonite                             | 16 <sup>r</sup>  | 15,000 <sup>r</sup> | 22       | 25,600 | Greece, 27%; China, 24%; United Kingdom, 20%; Mexico, 15%;<br>Egypt, 8%. |
| Chamotte or Dina's Earth              | (2)              | 127 <sup>r</sup>    | (2)      | 124    | Czech Republic, 71%; China, 14%; United Kingdom, 14%.                    |
| China clay or kaolin                  | 467 <sup>r</sup> | 56,000 <sup>r</sup> | 518      | 54,400 | Brazil, 97%.   |
| Fire clay                             | 3                | 1,150 <sup>r</sup>  | 6        | 2,510  | China, 99%.  |
| Fuller's earth                        | 8                | 434                 | 4        | 183    | China, 84%; Japan, 16%.  |
| Total                                 | 518 <sup>r</sup> | 86,900 <sup>r</sup> | 576      | 96,900 |  |

<sup>r</sup>Revised.

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

<sup>2</sup>Less than ½ unit.

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

TABLE 15  
BENTONITE: WORLD PRODUCTION, BY COUNTRY<sup>1,2,3</sup>

(Metric tons)

| Country <sup>4</sup>      | 2010                  | 2011                 | 2012                   | 2013                   | 2014                 |
|---------------------------|-----------------------|----------------------|------------------------|------------------------|----------------------|
| Algeria                   | 34,126                | 29,000               | 26,278 <sup>r</sup>    | 27,668 <sup>r</sup>    | 31,510               |
| Argentina                 | 229,301               | 228,357              | 193,795                | 262,899 <sup>r</sup>   | 225,000 <sup>e</sup> |
| Armenia                   | 1,397                 | 835                  | 4,987                  | 15,387 <sup>r</sup>    | 798                  |
| Australia <sup>e</sup>    | 230,000               | 230,000              | 230,000                | 230,000                | 230,000              |
| Azerbaijan                | 18,073                | 20,700 <sup>r</sup>  | 157,875 <sup>r</sup>   | 91,958 <sup>r</sup>    | 76,512               |
| Bolivia                   | 440                   | 591                  | 745                    | 182 <sup>r</sup>       | 886                  |
| Bosnia and Herzegovina    | 314                   | 17,662 <sup>r</sup>  | 18,000 <sup>r</sup>    | 18,808                 | 80,952               |
| Brazil, beneficiated      | 531,693               | 566,267              | 512,975                | 434,000 <sup>r</sup>   | 440,000 <sup>e</sup> |
| Bulgaria                  | 100,000 <sup>e</sup>  | 54,000               | 78,000                 | 80,000 <sup>r,e</sup>  | 80,000 <sup>e</sup>  |
| Burma                     | NA <sup>r</sup>       | NA <sup>r</sup>      | --                     | 1,552 <sup>r</sup>     | 1,500 <sup>e</sup>   |
| Canada                    | 4,542                 | 2,266                | 2,015                  | 3,451                  | 2,083                |
| Chile                     | --                    | 1,255                | 893                    | 3,313 <sup>r</sup>     | 1,083                |
| China <sup>e</sup>        | 3,400,000             | 3,500,000            | 3,500,000              | 3,600,000              | 3,650,000            |
| Colombia <sup>e</sup>     | 8,500                 | 8,500                | 8,500                  | 9,056 <sup>s</sup>     | 9,000                |
| Cuba                      | 228                   | 1,244                | 670                    | 335                    | 700                  |
| Cyprus                    | 162,969 <sup>r</sup>  | 160,625 <sup>r</sup> | 160,180                | 158,386                | 140,174              |
| Czech Republic            | 183,000               | 160,000              | 221,000                | 226,000                | 301,000              |
| Denmark                   | 23,832                | 38,300               | 30,330                 | 56,355                 | 66,388               |
| Egypt                     | 28,865 <sup>r</sup>   | 33,132 <sup>r</sup>  | 30,000 <sup>e</sup>    | 30,000 <sup>e</sup>    | 30,000 <sup>e</sup>  |
| Georgia <sup>e</sup>      | 5,000                 | 4,800                | 4,900                  | 5,000                  | 5,000                |
| Germany                   | 362,623               | 375,332              | 366,220 <sup>r</sup>   | 358,854 <sup>r</sup>   | 395,000              |
| Greece, crude             | 1,381,643             | 1,188,442            | 1,235,105              | 1,000,000              | 1,011,485            |
| Guatemala                 | 22,423                | 12,270               | 16,183 <sup>r</sup>    | 18,377 <sup>r</sup>    | 38,368               |
| Hungary, crude            | 6,000 <sup>r</sup>    | 7,000 <sup>r</sup>   | 1,000 <sup>r</sup>     | 3,000 <sup>r</sup>     | 6,000                |
| India <sup>e</sup>        | 561,000               | 739,000              | 996,000                | 1,100,000 <sup>r</sup> | 1,100,000            |
| Indonesia <sup>e</sup>    | 6,500                 | 6,500                | 7,000                  | 6,000                  | 6,000                |
| Iran                      | 542,900 <sup>r</sup>  | 422,000 <sup>r</sup> | 427,000 <sup>r</sup>   | 397,100 <sup>r</sup>   | 419,700              |
| Iraq                      | 6,127                 | 6,452                | 6,530                  | 6,288                  | 255                  |
| Italy                     | 111,000               | 102,000 <sup>r</sup> | 144,000 <sup>r</sup>   | 103,000 <sup>r</sup>   | 100,000 <sup>e</sup> |
| Japan <sup>e</sup>        | 430,000               | 425,000              | 420,000                | 420,000 <sup>r</sup>   | 420,000              |
| Kenya <sup>e</sup>        | 70                    | 70 <sup>r</sup>      | 75                     | 80                     | 110                  |
| Korea, Republic of        | 88,255                | 94,987               | 88,543                 | 80,188                 | 71,850               |
| Macedonia                 | 12,798                | 14,463 <sup>r</sup>  | 6,900                  | 26,820                 | 19,166               |
| Malawi                    | 2,100                 | 2,450                | --                     | -- <sup>e</sup>        | -- <sup>e</sup>      |
| Mexico                    | 590,998               | 563,795              | 956,224                | 826,886 <sup>r</sup>   | 474,025              |
| Morocco                   | 110,700               | 97,071               | 91,200                 | 105,240 <sup>r</sup>   | 98,757               |
| Mozambique, processed     | 459                   | 493                  | 1,459                  | 968                    | 1,250                |
| New Zealand, processed    | 1,216                 | --                   | 2,263 <sup>r</sup>     | 762 <sup>r</sup>       | --                   |
| Pakistan                  | 32,604 <sup>r</sup>   | 26,336 <sup>r</sup>  | 19,997 <sup>r</sup>    | 25,117 <sup>r</sup>    | 44,115               |
| Peru                      | 44,266                | 27,534               | 22,977                 | 47,744                 | 37,375               |
| Philippines               | 1,475                 | 2,087                | 2,699 <sup>r</sup>     | 3,329 <sup>r</sup>     | 3,369                |
| Poland, crude             | 2,200                 | 900                  | 800                    | 1,018 <sup>r</sup>     | 1,000 <sup>e</sup>   |
| Romania                   | 20,000 <sup>r,e</sup> | 18,008 <sup>r</sup>  | 18,127                 | 21,051                 | 22,000 <sup>e</sup>  |
| Russia <sup>e</sup>       | 500,000               | 500,000              | 550,000                | 550,000                | 560,000              |
| Slovakia                  | 130,521               | 119,323              | 129,930                | 129,877 <sup>r</sup>   | 130,000 <sup>e</sup> |
| Slovenia                  | 135                   | 168                  | 98                     | 143                    | 199                  |
| South Africa              | 54,311                | 120,417              | 120,592 <sup>r</sup>   | 177,187 <sup>r</sup>   | 175,000 <sup>e</sup> |
| Spain                     | 157,001               | 110,731 <sup>r</sup> | 96,605 <sup>r</sup>    | 112,887 <sup>r</sup>   | 113,000 <sup>e</sup> |
| Thailand                  | 130                   | 55,220               | 141,000                | 150                    | --                   |
| Turkey                    | 798,397               | 471,528              | 1,033,568              | 622,872 <sup>r</sup>   | 1,088,444            |
| Turkmenistan <sup>e</sup> | 50,000 <sup>r</sup>   | 50,000 <sup>r</sup>  | 50,000 <sup>r</sup>    | 50,000 <sup>r</sup>    | 7,387 <sup>s</sup>   |
| Ukraine <sup>e</sup>      | 185,000               | 211,000              | 219,000 <sup>r,s</sup> | 220,000 <sup>r</sup>   | 210,000              |

See footnotes at end of table.

TABLE 15—Continued  
BENTONITE: WORLD PRODUCTION, BY COUNTRY<sup>1,2,3</sup>

(Metric tons)

| Country <sup>4</sup>    | 2010                    | 2011                    | 2012                    | 2013                    | 2014       |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|------------|
| United States           | 4,600,000               | 4,990,000               | 4,980,000               | 4,350,000               | 4,800,000  |
| Uruguay                 | 430                     | 1,210                   | 5,530                   | 8,974                   | 7,800      |
| Uzbekistan <sup>e</sup> | 20,000                  | 25,000                  | 25,000                  | 26,000 <sup>r</sup>     | 26,000     |
| Total                   | 15,800,000 <sup>r</sup> | 15,800,000 <sup>r</sup> | 17,400,000 <sup>r</sup> | 16,100,000 <sup>r</sup> | 16,800,000 |

<sup>e</sup>Estimated. <sup>r</sup>Revised. -- Zero. NA Not available.

<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>Includes data available through September 22, 2016.

<sup>3</sup>Production may include fuller's earth for some countries.

<sup>4</sup>In addition to the countries listed, France and Vietnam are thought to produce bentonite, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

<sup>5</sup>Reported figure.

TABLE 16  
FULLER'S EARTH: WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

| Country <sup>3</sup>                | 2010                   | 2011                   | 2012                   | 2013                   | 2014                 |
|-------------------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|
| Australia, attapulgite <sup>e</sup> | 10,000                 | 8,000 <sup>r</sup>     | 10,000                 | 10,543 <sup>r,4</sup>  | 10,176 <sup>4</sup>  |
| India <sup>e</sup>                  | 5,600                  | 5,600                  | 5,600                  | 5,600                  | 5,600                |
| Japan <sup>e</sup>                  | 110,000                | 110,000                | 110,000                | 110,000                | 110,000              |
| Korea, Republic of                  | 83,476                 | 46,623                 | 57,787                 | 51,309                 | 54,001               |
| Mexico                              | 170,350                | 107,436                | 227,496 <sup>r</sup>   | 306,507 <sup>r</sup>   | 245,147              |
| Morocco, smectite                   | 82,570                 | 103,682 <sup>r</sup>   | 81,800                 | 59,000 <sup>r</sup>    | 73,500               |
| Pakistan                            | 6,370                  | 4,686 <sup>r</sup>     | 7,666 <sup>r</sup>     | 4,442 <sup>r</sup>     | 9,914                |
| Senegal, attapulgite                | 204,000                | 181,000                | 180,000 <sup>e</sup>   | 235,000 <sup>r</sup>   | 191,000              |
| South Africa, attapulgite           | 85,336                 | 14,448                 | 15,019 <sup>r</sup>    | 21,233 <sup>r</sup>    | 18,376               |
| Spain:                              |                        |                        |                        |                        |                      |
| Attapulgite                         | 27,841                 | 26,021                 | 23,537 <sup>r</sup>    | 25,439 <sup>r</sup>    | 25,400 <sup>e</sup>  |
| Sepiolite                           | 557,862                | 566,270                | 622,000 <sup>r</sup>   | 622,000 <sup>r,e</sup> | 622,000 <sup>e</sup> |
| Turkey, sepiolite <sup>e</sup>      | 10,000                 | 10,000                 | 10,000                 | 10,000                 | 10,000               |
| United States <sup>5</sup>          | 2,050,000              | 1,950,000              | 1,980,000              | 1,990,000              | 1,980,000            |
| Total                               | 3,400,000 <sup>r</sup> | 3,130,000 <sup>r</sup> | 3,330,000 <sup>r</sup> | 3,450,000 <sup>r</sup> | 3,350,000            |

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

<sup>1</sup>Does not include centrally planned economy countries and former such countries, some of which presumably produce fuller's earth but for which no information is available. Includes data available through September 23, 2016.

<sup>2</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>3</sup>In addition to the market economy countries listed, Algeria, France, Italy, and Iran have reportedly produced 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.

<sup>4</sup>Reported figure.

<sup>5</sup>Excludes attapulgite.

TABLE 17  
KAOLIN: WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

| Country <sup>3</sup>                | 2010                   | 2011                   | 2012                   | 2013                   | 2014                 |
|-------------------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|
| Algeria                             | 71,065                 | 71,065 <sup>r</sup>    | 100,970 <sup>r</sup>   | 42,504 <sup>r</sup>    | 181,068              |
| Argentina                           | 78,722                 | 54,166                 | 66,574                 | 75,863 <sup>r</sup>    | 75,000 <sup>e</sup>  |
| Australia                           | 114,157 <sup>r</sup>   | 46,388 <sup>r</sup>    | 89,229 <sup>r</sup>    | 204,521 <sup>r</sup>   | 210,000 <sup>e</sup> |
| Austria, crude                      | 58,956                 | 56,976                 | 43,174                 | 40,055 <sup>r</sup>    | 36,334               |
| Bangladesh <sup>4</sup>             | 8,500                  | --                     | --                     | --                     | --                   |
| Bosnia and Herzegovina, crude       | 41,808                 | 232,147                | 149,495                | 44,940                 | 21,610               |
| Brazil, beneficiated                | 2,000,000              | 1,927,000              | 2,189,000              | 2,139,000 <sup>r</sup> | 2,100,000            |
| Bulgaria, crude                     | 700,088 <sup>r</sup>   | 728,003 <sup>r</sup>   | 1,006,239 <sup>r</sup> | 877,086 <sup>r</sup>   | 900,000 <sup>e</sup> |
| Canada                              | 5,000 <sup>e</sup>     | --                     | --                     | --                     | --                   |
| Chile                               | 62,226                 | 59,912                 | 60,429                 | 60,000 <sup>e</sup>    | 60,000 <sup>e</sup>  |
| China <sup>c</sup>                  | 3,260,000              | 3,200,000              | 3,300,000              | 3,300,000              | 3,300,000            |
| Cuba                                | 100                    | 3,000                  | 4,000                  | 3,600                  | 1,700                |
| Czech Republic, crude               | 3,493,000              | 3,606,000              | 3,318,000              | 3,108,000              | 3,281,000            |
| Ecuador                             | 41,089                 | 95,062 <sup>r</sup>    | 42,564 <sup>r</sup>    | 100,195 <sup>r</sup>   | 40,236               |
| Egypt <sup>e</sup>                  | 304,200 <sup>s</sup>   | 300,000 <sup>r</sup>   | 300,000                | 300,000                | 300,000              |
| Eritrea <sup>e</sup>                | 210                    | 240                    | 250                    | 260 <sup>r</sup>       | 260                  |
| Ethiopia <sup>e,6</sup>             | 3,600                  | 4,000 <sup>s</sup>     | 4,500 <sup>r</sup>     | 4,800 <sup>r</sup>     | 4,600                |
| France, marketable <sup>c</sup>     | 315,000                | 315,000                | 315,000 <sup>r</sup>   | 267,000 <sup>r,5</sup> | 317,000 <sup>s</sup> |
| Germany                             | 4,560,086              | 4,898,516              | 4,398,796 <sup>r</sup> | 4,290,000 <sup>r</sup> | 4,275,000            |
| Greece                              | 3,493                  | 7,250                  | 6,268                  | --                     | --                   |
| Guatemala                           | 2,143                  | 4,057 <sup>r</sup>     | 1,866                  | 2,953                  | 1,285                |
| Hungary, beneficiated <sup>e</sup>  | 238,921 <sup>s</sup>   | 248,263 <sup>s</sup>   | 250,000 <sup>r</sup>   | 310,000 <sup>r</sup>   | 320,000              |
| India: <sup>e</sup>                 |                        |                        |                        |                        |                      |
| Processed                           | 78,000 <sup>r</sup>    | 76,000 <sup>r</sup>    | 101,000 <sup>r</sup>   | 78,000 <sup>r</sup>    | 67,000               |
| Salable crude                       | 2,700,000 <sup>r</sup> | 2,900,000 <sup>r</sup> | 3,400,000 <sup>r</sup> | 4,400,000 <sup>r</sup> | 4,700,000            |
| Indonesia <sup>c</sup>              | 170,000                | 175,000                | 180,000                | 180,000 <sup>r</sup>   | 180,000              |
| Iran                                | 761,500 <sup>r</sup>   | 762,000 <sup>r</sup>   | 800,000 <sup>r</sup>   | 946,400 <sup>r</sup>   | 820,100              |
| Italy <sup>c</sup>                  | 6,000 <sup>r</sup>     | 8,000 <sup>r</sup>     | 8,000 <sup>r</sup>     | 8,000 <sup>r</sup>     | 8,000                |
| Japan <sup>c</sup>                  | 12,000                 | 13,000                 | 13,000                 | 13,000 <sup>r</sup>    | 13,000               |
| Jordan                              | 114,931 <sup>r</sup>   | 89,903                 | 76,194 <sup>r</sup>    | 80,000 <sup>r,5</sup>  | 80,000 <sup>e</sup>  |
| Kenya <sup>c</sup>                  | 970 <sup>r</sup>       | 1,000 <sup>r</sup>     | 1,000 <sup>r</sup>     | 1,100 <sup>r</sup>     | 1,600                |
| Korea, Republic of                  | 764,008                | 798,690                | 514,841 <sup>r</sup>   | 532,050 <sup>r</sup>   | 429,081              |
| Kyrgyzstan                          | NA                     | 108,900                | 113,900                | 133,500                | 1,121,800            |
| Madagascar                          | 259                    | 260                    | 230 <sup>r</sup>       | 200 <sup>r</sup>       | 200 <sup>e</sup>     |
| Malaysia                            | 530,331                | 442,550                | 438,923                | 513,287 <sup>r</sup>   | 300,000 <sup>e</sup> |
| Mexico                              | 120,094                | 120,003                | 163,148                | 379,110 <sup>r</sup>   | 342,917              |
| New Zealand                         | 10,700                 | 21,545                 | 11,578                 | 13,066 <sup>r</sup>    | 61,382               |
| Pakistan                            | 22,616 <sup>r</sup>    | 16,481 <sup>r</sup>    | 25,497 <sup>r</sup>    | 20,156 <sup>r</sup>    | 13,803               |
| Peru                                | 16,678                 | 18,169                 | 34,585 <sup>r</sup>    | 32,249                 | 19,964               |
| Philippines                         | NA                     | NA                     | NA                     | 6,568                  | 7,050                |
| Poland, beneficiated                | 124,600 <sup>r</sup>   | 163,600 <sup>r</sup>   | 137,800 <sup>r</sup>   | 150,000 <sup>r,5</sup> | 150,000 <sup>e</sup> |
| Portugal, washed and unwashed       | 273,890                | 322,091 <sup>r</sup>   | 321,039 <sup>r</sup>   | 248,008 <sup>r</sup>   | 264,872              |
| Romania                             | 500 <sup>r</sup>       | -- <sup>r</sup>        | --                     | --                     | --                   |
| Russia                              | 105,000                | 297,000 <sup>r</sup>   | 283,000 <sup>r</sup>   | 711,000 <sup>r</sup>   | 779,000              |
| Saudi Arabia                        | 62,000 <sup>r</sup>    | 65,000 <sup>r</sup>    | 137,000 <sup>r</sup>   | 101,000 <sup>r</sup>   | 106,000              |
| Serbia                              | 152,000                | 379,000                | 155,000                | 156,000                | 214,000              |
| Slovakia <sup>e</sup>               | -- <sup>r</sup>        | 4,000 <sup>r</sup>     | 3,000 <sup>r</sup>     | 6,000 <sup>r</sup>     | 6,000                |
| South Africa                        | 29,929                 | 15,220                 | 20,791 <sup>r</sup>    | 22,295 <sup>r</sup>    | 27,258               |
| Spain, marketable, crude and washed | 184,000 <sup>r</sup>   | 195,000 <sup>r</sup>   | 247,000 <sup>r</sup>   | 247,000 <sup>r,5</sup> | 247,000 <sup>e</sup> |
| Sri Lanka                           | 8,207                  | 11,157 <sup>r</sup>    | 11,805 <sup>r</sup>    | 12,990 <sup>r</sup>    | 13,000 <sup>e</sup>  |
| Sudan                               | 32,696                 | 15,096                 | 11,579                 | 26,000                 | 33,770               |
| Taiwan                              | 18,097                 | 16,936                 | 26,376                 | 15,963                 | 1,808                |
| Tanzania                            | 58                     | 178                    | 2,161                  | 1,816                  | 3,809                |
| Thailand, beneficiated              | 156,827 <sup>r</sup>   | 163,881 <sup>r</sup>   | 141,764 <sup>r</sup>   | 119,512 <sup>r</sup>   | 124,094              |
| Turkey                              | 787,287                | 1,229,352              | 988,081 <sup>r</sup>   | 1,168,441 <sup>r</sup> | 2,032,103            |
| Uganda                              | 27,237                 | 20,883                 | 42,886                 | 43,875 <sup>r</sup>    | 46,286               |

See footnotes at end of table.

TABLE 17—Continued  
KAOLIN: WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

| Country <sup>3</sup>        | 2010                    | 2011                    | 2012                    | 2013                    | 2014                |
|-----------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------|
| Ukraine                     | 1,085,000               | 1,317,000               | 1,218,000 <sup>r</sup>  | 1,179,000 <sup>r</sup>  | 1,426,000           |
| United Kingdom <sup>c</sup> | 1,140,000 <sup>r</sup>  | 1,290,000 <sup>r</sup>  | 1,150,000 <sup>r</sup>  | 1,110,000 <sup>r</sup>  | 1,090,000           |
| United States               | 5,420,000               | 5,950,000               | 5,900,000               | 6,140,000 <sup>r</sup>  | 6,250,000           |
| Uzbekistan <sup>c</sup>     | 500,000 <sup>r</sup>    | 300,000 <sup>r</sup>    | 300,000 <sup>r</sup>    | 70,286 <sup>r,5</sup>   | 64,605 <sup>5</sup> |
| Venezuela                   | 9,444                   | 1,482                   | 2,447                   | 2,793                   | --                  |
| Total                       | 30,800,000 <sup>r</sup> | 33,200,000 <sup>r</sup> | 32,600,000 <sup>r</sup> | 34,000,000 <sup>r</sup> | 36,500,000          |

<sup>c</sup>Estimated. <sup>r</sup>Revised. NA Not available. -- 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>Includes data available through September 22, 2016.

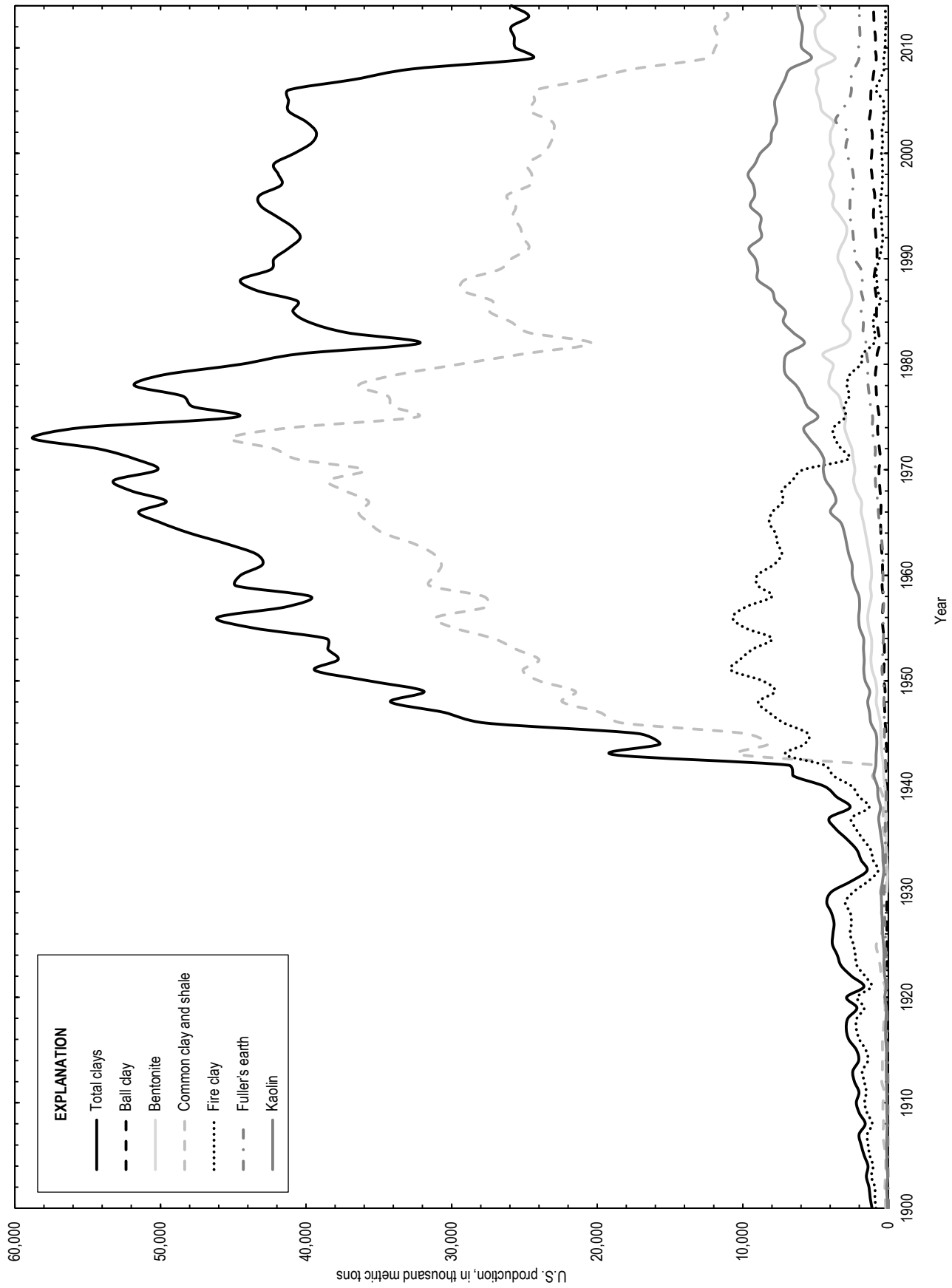
<sup>3</sup>In addition to the countries listed, Belgium, Denmark, Nigeria, Paraguay, Vietnam, and Zambia produced kaolin, but information is inadequate to make reliable estimates of output levels.

<sup>4</sup>Data are for the fiscal year ending June 30 of the following year.

<sup>5</sup>Reported figure.

<sup>6</sup>Data are for the fiscal year ending July 7 of the year listed.





**Figure 1.** U.S. production (sold or used by producers) of all clay types from 1900 through 2014.