



2015 Minerals Yearbook

**FELDSPAR AND NEPHELINE SYENITE
[ADVANCE RELEASE]**

FELDSPAR AND NEPHELINE SYENITE

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In 2015, feldspar production in the United States was estimated to be 520,000 metric tons (t) valued at \$38.2 million, a slight decrease in quantity from 530,000 t but a 10% increase in value from \$34.8 million in 2014 (table 1). Exports of feldspar in 2015 decreased by 5.6% to 15,100 t, valued at \$4.9 million, and imports of feldspar increased to 120,000 t, valued at \$7.1 million. Imports of nepheline syenite (predominantly from Canada) decreased by 11% to about 449,000 t valued at \$67.6 million. World production of feldspar was estimated to be 22.3 million metric tons (Mt) (tables 1, 7).

Feldspars, which constitute about 60% of the earth's crust, are anhydrous aluminosilicate minerals of two main groupings: the alkali feldspars that range from potassium- to sodium-aluminosilicates and the plagioclase feldspars that are sodium- to calcium-aluminosilicates. The alkali feldspars are most useful in glassmaking and ceramics and the plagioclase feldspars are mainly used in ceramics (especially the higher sodium varieties) and various construction applications. Feldspar with higher calcium content is used more often for its alumina content or in construction. Nepheline syenite is a rock composed of alkali feldspars and nepheline feldspathoid minerals, which essentially formed in place of alkali feldspars because the magma (melt) was deficient in silica with little to no quartz present. Nepheline syenite has uses similar to those of feldspar.

Apparent consumption of feldspar and nepheline syenite combined was more than 1 Mt, primarily in ceramics and glass production for use in the construction industry but also as filler in various products such as paints and coatings (table 4). Domestic feldspar production data include feldspar-quartz mixtures from silica producers, and aplite (a rock with quartz and feldspar as the dominant minerals) from one producer. Domestic nepheline syenite production primarily was used in the production of roofing granules, but was also used in the production of ceramic and porcelain tiles and in other construction applications. Discussion of nepheline syenite follows that of feldspar.

Feldspar

Production.—Data on domestic production, sales, and use of feldspar in this report are based on data collected by the U.S. Geological Survey (USGS) by means of a voluntary survey. Production for operations not reporting was estimated using prior-year reported output levels supplemented with worker-hour reports from the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). Of the seven companies, six responded to the canvass, representing 62% of the 2015 production tonnages listed in tables 1 and 2.

Feldspar was mined in six States. North Carolina was by far the leading producer State; the remaining five were, in descending order of estimated output, Idaho, Virginia,

California, South Dakota, and Oklahoma. Seven companies mined and processed feldspar from 10 mines and beneficiating facilities—4 in North Carolina, 2 in California, and 1 in each of the 4 remaining States (table 3). Imerys Ceramics, Monticello, GA, formerly part of the Feldspar Corp., ceased production during 2014.

I-Minerals Inc. produced small quantities of feldspathic (feldspar-quartz) sands for use in the production of ceramic tiles from its WBL Tailings resource area, which was adjacent to the company's main Helmer-Bovill kaolin property in north-central Idaho. The WBL Tailings are feldspar-quartz-rich materials that were left on the property from 1960 to 1974 by the mine operator, who then was focused on the kaolin component of the ores. I-Minerals' reclamation mining permit allows it to mine about 45,000 metric tons per year (t/yr) of feldspathic sand between June and October of each year through 2022. Sales of feldspar-quartz sand to Quarry Tile Co. (Spokane, WA) were expected to double by 2016 from those of 2014 to supply Quarry Tile's new tile plant. In addition to providing a revenue stream, the sale of sands from WBL reduced the tailings storage requirements for the company (I-Minerals Inc., 2014). WBL Tailings was one of three mineral resource areas on the company's Helmer-Bovill property, a multiminerals project from which the company expected an annual production of 45,000 t of potassium feldspar during a projected 25-year mine lifespan (I-Minerals Inc., 2016).

Consumption.—In 2015, an estimated 58% of domestic feldspar sold or used was consumed in the manufacture of glass, including glass containers, flat glass, specialty glass, and fiberglass for home insulation; feldspar use for glass increased by about 14% (table 4). In glassmaking, feldspar promotes the mixing of the melt components by fluxing (reducing the melting temperature and the viscosity) the system. The alkalis in feldspar (especially potassium and sodium ions) lower the melting temperature and chemically bond with and promote the fusing of the other glass batch minerals such as quartz. Alumina and calcium ions in feldspar impart increased resistance to physical and chemical breakdown of the glass product.

Much of the remaining feldspar consumption was in the manufacture of ceramics, including ceramic and porcelain tile, electrical insulators, sanitaryware, and tableware. In ceramics, as in glassmaking, the alkalis (calcium, potassium, and sodium) in feldspar act as flux, working with soda ash to lower the melting temperature of the mixture while increasing the fusibility of the batch materials. Feldspar also controls the degree of vitrification of the ceramic body during firing. Smaller quantities of feldspar were used as fillers and extenders in paint, plastics, and rubber.

In 2015, a number of factors may have contributed to the decrease in the production and consumption of domestic feldspar—increased production and transportation costs; increased feldspar imports, especially of potassium feldspar

(domestically in increasingly shorter supply); substitution of nepheline syenite for feldspar in ceramic (especially porcelain) tile; and competition from imported ceramic tile (Whitmire, 2016a).

The use of materials other than glass for containers for products such as baby food, fruit juices, mineral water, and wine, and a recent trend to import less expensive containers from China competed with domestic glass containers and thus reduced domestic consumption of traditional raw materials for glass manufacture. The use of cullet (recycled broken or waste glass) in the manufacture of glass containers was increasing as a result of growth in domestic recycling programs, which also competed with primary raw materials such as feldspar (Glass Packaging Institute, 2017).

The construction industry is a major consumer of glass and ceramic products, particularly for windows, flooring, and sanitaryware. In the United States, construction starts for new private housing increased by 11% to slightly more than 1.1 million units in 2015. This continued the upward trend that began in 2010. The 2015 housing starts, however, remained lower than those reported from at least 1959 through 2007. Completions of privately owned housing increased by 9.5% to 968,000 units in 2015 from 884,000 units completed in 2014 (U.S. Census Bureau, 2016b). The value of total construction put in place, which uses significant quantities of flat glass and ceramic tile products, increased for the fourth consecutive year, up by about 11% to more than \$1.11 trillion in 2015 from slightly more than \$1 trillion in 2014. Total construction spending had peaked at \$1.16 trillion in 2006 (U.S. Census Bureau, 2016a).

In 2015, U.S. production of ceramic and porcelain tiles remained steady at 76 million square meters (Biral di, 2016a, p. 80). Feldspar use in all ceramics decreased by about 15% (table 4), perhaps in part as the result of increased substitution of domestic nepheline syenite for feldspar in darker colored ceramic tiles. Shipments of tile increased for the sixth consecutive year. Sales were up by 10% to 83.4 million square meters in 2015 from 75.8 million square meters in 2014. In 2015, imports of tile maintained the same market share, accounting for 69% of United States tile consumption; major sources were China (29%), Mexico (27%), Italy (19%), Spain (7%), and Turkey (5%). Exports of tile in 2015 increased by 10%, with the majority going to Canada (57%) and Mexico (19%) (Whitmire, 2016a).

Porcelain tile, which is less porous than ceramic tile, increasingly was becoming the tile of choice in the United States; the majority of 2015 U.S. imports for flooring were of porcelain tile rather than ceramic tile. Dallas-based Dal-Tile Corp. (Daltile) (a subsidiary of Mohawk Industries Inc.) announced in September that construction of its glazed porcelain and colorbody tile manufacturing plant in Dickson, TN, was 50% completed and on schedule to begin operation the first quarter of 2016 (Tennessean, The, 2015). Owing to the high cost of shipping the typically heavy tile products to the United States, some foreign tile manufacturers were finding it cost-effective to build tile manufacturing plants in the United States to help fill the growing U.S. demand for porcelain tile. In Loudon, TN, Del Conca USA, a subsidiary

of Del Conca Group (Italy), produced porcelain ceramic tile at its recently (2014) constructed \$50 million 2.8-million-square-meter-per-year porcelain ceramic tile plant (Williams, 2016). Noting the proximity of important raw materials for the tile industry, such as clays and feldspar, United States Tile, Inc., the North American subsidiary of Italy-based Gruppo Concorde, proceeded with construction of an \$85 million porcelain ceramic tile plant in Mt. Pleasant, TN, which would be operational in the latter half of 2016 (Daily Herald, The, 2015). Near yearend, China-based Wonderful Group began construction of a \$150 million 46,500-square-meter-per-year ceramic tile plant in Lebanon, TN, with operations expected to begin by late 2016 (Freifelder, 2015).

The automobile industry was also a major consumer of glass products. In 2015, for the sixth consecutive year, the production and the sales of automobiles and light trucks in North America increased. Production increased by 3% in 2015 from that in 2014, following a 5.6% increase in 2014 from that in 2013 (Ward's Automotive Group, 2017a). Sales increased by 5.9% in 2015 from those in 2014, following a 6% increase in 2014 from those in 2013 (Ward's Automotive Group, 2017b).

Foreign Trade.—In 2015, about 49% of United States exports of feldspar went to Norway, 21% to Venezuela, about 18% to Canada, about 7% to Colombia, and most of the remainder to countries in Central America (table 5). In 2015, a large majority of imports of feldspar were from Turkey, with substantially less coming from, in descending order of quantity, Spain, Germany, India, Mexico, and Australia (table 6). Most of the shipments of feldspar from Turkey were imported by two companies: one a manufacturer of ceramic and porcelain floor and wall tiles and the other a producer and supplier of raw materials used in the production of ceramic tiles and sanitaryware.

World Review.—More than 70 countries had significant resources of feldspar and about 50 produced feldspar in 2015; estimated world production was 22.3 Mt. The leading feldspar-producing countries in 2015 were estimated to be Turkey and Italy, followed by China, India, and Thailand, in descending order of estimated production (table 7).

Worldwide ceramic tile production remained virtually unchanged in 2015 at 12.4 billion square meters with only minimal change in any producing region. China, the world's leading tile producer, accounted for 48% of world production, and Brazil and India maintained their rankings as second and third, respectively. Ceramic tile production, about 50% of which was for floor tile, increased by percentage most substantially in Vietnam (by 22%) and decreased most substantially in Indonesia (by 12%) and Iran (by 27%) (Biral di, 2016a).

Global consumption of ceramic tile increased slightly to 12.2 billion square meters. China, the world's leading ceramic tile consumer, accounted for 40% of world consumption and Brazil and India ranked second and third, respectively (Biral di, 2016a).

Although China continued to be the leading exporter with 40% of world exports, exports from China decreased for the second consecutive year. Spain and Italy ranked second and third in ceramic tile exports with 14% and 12% of world exports, respectively; exports from Spain increased by 12% and exports from Italy increased slightly (Biral di, 2016a).

China.—Feldspar was mined in the eastern and southeastern Provinces of China. Ranked third globally, China produced an estimated 2.5 Mt of feldspar in 2015, which was used in the production of ceramic tile, sanitaryware, and tableware. Porcelain tile was the main type of ceramic tile produced, followed by polished and antique-style tile. The country's ceramic tile output decreased slightly to 5.97 billion square meters, of which nearly 1.09 billion square meters was exported (Biral di, 2016a). China produced more than one-third of the world's sanitaryware, accounting for 46% of world exports (Biral di, 2016b).

Greenland.—Hudson Resources Inc. continued work on its Naajat (White Mountain) anorthosite (calcium feldspar) project in western Greenland; the project had an inferred resource of 27 Mt. At midyear, Hudson Resources entered into a binding 10-year agreement with Owens Corning Inc., in which Owens Corning agreed to purchase anorthosite from Naajat for use as feed material at its fiberglass plants. Subject to final financing, permitting, and mine commissioning, initial plans called for production of 200,000 t/yr, with a major portion of that being covered by the Owens Corning agreement. Hudson expected to begin shipments in the second half of 2016 (Patel, 2015). Previous testing deemed the Naajat anorthosite suitable for electrical-grade glass (E-glass), which is the most common glass fiber used in composites, fabrics, and glass-reinforced plastics for products where strength and high electrical resistivity are required. Other potential applications for the alumina being evaluated and marketed were in nonmetallurgical applications typically used for refractories and ceramics; as filler and coating material for paints, paper, and plastics; and even potentially as a feed for aluminum smelters (Hudson Resources Inc., 2014). The project's environmental impacts are expected to be low because it is essentially a rock quarry and dock facility with nearby access to shipping on the tidewater and because of the purity of the ore, thereby not requiring chemicals or water for onsite processing (Hudson Resources Inc., 2013).

India.—Of the more than 1.5 Mt of feldspar that was produced in India during fiscal year (FY) 2015, about 44% was exported, up from 29% (revised) in FY 2014 but significantly lower than the 47% that was exported in FY 2012 (Indian Bureau of Mines 2015, 2016).

Italy.—Most of Italy's feldspar output was consumed in the domestic ceramics industry. The country exported about 280,000 t of feldspar in 2015 and imported more than 2 Mt, nearly 92% of which came from Turkey (United Nations Statistics Division, undated a). Production of ceramic tile, the leading sector of the country's ceramics industry and a significant consumer of feldspar, increased by 3.4% to 395 million square meters in 2015 from 382 million square meters in 2014 (Biral di, 2016a). Total exports for the ceramic tile industry increased slightly to 320 million square meters in 2015, more than offsetting a slight dip to 81 million square meters in domestic sales for the year (Confindustria Ceramica, 2016).

Philippines.—AIM Exploration Inc. (Henderson, NV), in a joint venture (40%) with controlling company Paladino Management & Development Corp. (Makati City, Philippines), announced that Paladino expected to complete an expansion of the joint venture's feldspar mine in the Philippines by yearend.

The companies, which have produced feldspar from the mine for some time, marketed the feldspar to ceramics companies and to beverage companies for glass container production. Paladino also was working with the Polymer Research Laboratory at the University of the Philippines, Diliman, regarding the use of feldspar as a commercial filler for rubber and plastics (Smith, 2015).

Turkey.—Turkey was the world's leading feldspar producer with an estimated 5 Mt in 2015 (table 7). Most of the country's production was exported: 42% to Italy; 22% to Spain; 8% to Russia; about 3% each to Bulgaria, Poland, and the United States; and 2% to Egypt (United Nations Statistics Division, undated a). Feldspar was mined in the southwestern part of Anatolia, mainly from the Menderes Massif.

Nepheline Syenite

Production.—Nepheline syenite was mined in Arkansas primarily for use as roofing granules for the asphalt shingle industry but also in lesser quantities as a flux in the manufacture of porcelain and ceramic floor tile in the southern and southeastern United States. It also was used in the manufacture of ceramic bricks and for asphalt and concrete aggregates and related products. Nepheline syenite, most of which contained 3% or more iron oxide, was produced by two companies for use in the production of darker body ceramic tiles. The 3M Co., Industrial Mineral Products Division, the leading U.S. producer supplying the tile industry, mined nepheline syenite from the Arch Street Mine, which is also a crushed-stone-producing facility that has been active since the 1930s. Granite Mountain Quarries Co. (a subsidiary of McGeorge Contracting Co. Inc.) produced nepheline syenite from Granite Mountain Quarry #1 and Granite Mountain Quarry #2. All properties are to the south and southeast of Little Rock, AR (Jay Lukkarila, Mining Engineer, 3M Co. Industrial Products Division, written commun., February 14, 2017; U.S. Department of Labor, Mine Safety and Health Administration, 2016).

Consumption.—In glass and ceramics manufacture, nepheline syenite, like feldspar, provides alkalis that act as a flux. In glass, nepheline syenite also supplies alumina, imparting the same benefits as feldspar. Nepheline syenite also typically is used as a filler in adhesives, paint, plastics, and sealants, and it can be used in the production of aluminum and fertilizers.

During the past several years, the consumption of Arkansas nepheline syenite for the manufacture of porcelain floor tile in the United States has been increasing. Exports increased by about 16% in 2015 from those of 2014. In 2015, about 9,500 t of the material were exported to a number of countries, most notably to Mexico (47%), Belgium (21%), Italy (10%), and Canada (7%) (United Nations Statistics Division, undated b). Additionally, a significant quantity of Arkansas nepheline syenite was used in the manufacture of brick. The 3M Co. test-marketed a nepheline syenite product containing a lower iron content to sectors of the ceramics industries (Jay Lukkarila, Mining Engineer, 3M Co. Industrial Products Division, written commun., February 18, 2016).

World Review.—Nepheline syenite was produced in Brazil, Canada, China, Norway, Russia, and Turkey for feldspathic uses. The leading producing company was Belgium-based

SCR-Sibelco NV, through its subsidiaries Sibelco Europe in Norway and Unimin Corp. in Canada. Others included Finetone Industrial Minerals Ltd. in China and OJSC Apatit AG and UC RUSAL in Russia.

Canada.—Canada's sole nepheline syenite producer, Unimin, operated two mines about 175 kilometers northeast of Toronto, Ontario—one at Blue Mountain and the other at Nephton. Production of marketable nepheline syenite was estimated to be 614,000 t in 2015, down from 654,000 t in 2014 (Natural Resources Canada, 2016). The material was consumed in the glass, ceramics, filler, and abrasives markets. Canada's nepheline syenite exports were 466,000 t in 2015, down by 16% from 556,000 t in 2014; 449,000 t was exported to the United States, down by 11% from 503,000 t in 2014 (United Nations Statistics Division, undated b).

Norway.—Sibelco Europe produced nepheline syenite in the summer and autumn from an open pit on the Arctic Island of Stjernoy. Onsite processing of the ore (crushing, drying, milling, sieving, magnetic separation, and air classification) resulted in various products for the glass, ceramics, and paint industries and for desulfurization of steel. In 2015, exports of nepheline syenite from Norway were 263,000 t, most of which went to other countries in Europe, including about 26% to Poland, 20% to the Netherlands, 15% to Germany, 13% to the United Kingdom, 12% to Italy, and 9% to France (United Nations Statistics Division, undated b).

Russia.—From its Kiya-Shaltyr Mine on the Goryachegorsk Massif in east-central Siberia, UC RUSAL produced 4.1 Mt of nepheline ore, a 6.5% decrease from 4.4 Mt produced in 2014, for use in the production of alumina. The company's production accounted for approximately 7% each of global production of alumina and aluminum. The decrease in production in 2015 was mainly owing to seasonal factors and weather conditions in the fourth quarter resulting in reduced alumina production at the Achinsk Alumina Refinery (UC RUSAL, 2016).

In 2015, phosphate producer PhosAgro AG, through its subsidiary OJSC Apatit, was Russia's only producer of marketed nepheline concentrate. At the Apatit mining and beneficiation complex, the company mined and processed apatite-nepheline ore from its reserves at the Khibiny deposit on the Kola Peninsula in the Murmansk region of northwest Russia. The Apatit operation produced phosphate rock, nepheline concentrates, and other mineral concentrates, including nepheline syenite for the glass and ceramics industries. In 2015, nepheline concentrate production increased slightly to 952,000 t and sales decreased slightly, with all sales going to Basel Cement Pikalevo (OJSC PhosAgro AG, 2016, p. 31).

Outlook

Production and transportation costs for U.S. producers of feldspar and nepheline syenite are expected to increase and feldspar reserves at some operations are becoming depleted. Domestic feldspar producers may find increasing competition from imports of feldspar, which have risen substantially in the past 2 years, especially with the recent decrease in quantities of economically mineable domestic potassium feldspar. Feldspar producers also may find competition from domestic nepheline syenite used in the production of some ceramic tiles. Higher

transportation charges for delivered raw materials could increase the cost of producing glass and tile.

Sales of glass food containers in the United States are expected to continue to increase slightly during the next several years as a result of consumer demand and Federal and State government initiatives for environmentally friendly and recyclable food and beverage packaging; this increase would likely increase feldspar consumption by glass container manufacturers. However, significant increases in glass container recycling and use of cullet could reduce the quantities of raw materials needed to manufacture these containers.

In the United States, new residential construction and commercial and residential remodeling is expected to increase, creating higher demand for ceramics, fiberglass, and glass, and thus for feldspar and nepheline syenite. Following the trend of the past several years, the ceramics industry is expected to continue to recover for the next several years, which is likely to increase the use of feldspar and nepheline syenite. Domestic consumption of ceramic tile is expected to continue to increase in 2016 with continued growth in residential construction (Whitmire, 2016b).

Worldwide, demand for ceramic tile is expected to rise as a result of increases in construction in the growing economies of Brazil, China, India, Indonesia, Russia, and South Africa, where most ceramic tile is consumed in the residential replacement market. Although consuming much of its own output, China is likely to continue to be an important exporter of ceramic tile. Residential replacement, which typically accounts for more than one-half of the total market globally, was projected to be the fastest growing market for ceramic tile at an estimated annual rate of growth of more than 8.5% from 2014 through 2020. Increased use of ceramic floor tiles as replacement for hardwood and other flooring items is expected because of high durability and frost and thermal shock resistance (GlobeNewswire, Inc., 2016). A trend in recent years of innovative ideas and products in ceramics, such as thinner, stronger ceramic sheets that can be laid without removing existing floor tiles, and an increasing percentage of porcelain tile production (especially in China and India) that offers superior physical and chemical characteristics, in part owing to increased feldspar content, are likely to help expand their use in the ceramics industry and thus the demand for feldspar and (or) nepheline syenite.

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TABLE 1
SALIENT FELDSPAR AND NEPHELINE SYENITE STATISTICS¹

		2011	2012	2013	2014	2015
United States:						
Production, feldspar: ^{e,2}						
Quantity ³	metric tons	580,000	560,000	550,000	530,000	520,000
Value	thousands	\$45,400	\$36,500	\$40,100	\$34,800	\$38,200
Exports, feldspar: ⁴						
Quantity	metric tons	17,400 ^r	13,600 ^r	17,700	16,000	15,100
Value ⁵	thousands	\$3,150 ^r	\$4,580 ^r	\$5,310	\$5,880 ^r	\$4,920
Imports for consumption: ⁴						
Feldspar:						
Quantity	metric tons	1,710	1,640	4,310	7,910	120,000
Value ⁶	thousands	\$476	\$342	\$1,110	\$3,120	\$7,090
Nepheline syenite:						
Quantity	metric tons	394,000	386,000	491,000	503,000	449,000
Value ⁶	thousands	\$41,500	\$44,200	\$59,300	\$64,000 ^r	\$67,600
Consumption, apparent ^{e,3,7}	metric tons	960,000	930,000	1,000,000	1,000,000	1,000,000
World, production ⁸	thousand metric tons	21,200	20,700	22,000 ^r	23,000 ^r	22,300 ^c

^eEstimated. ^rRevised.

¹Data are rounded to no more than three significant digits.

²Includes hand-cobbed feldspar, flotation-concentrate feldspar, feldspar in feldspar-quartz mixtures, and aplite; predominantly in the production of ceramics and glass, may differ from sales in table 4.

³Rounded to two significant digits to avoid disclosing company proprietary data.

⁴Source: U.S. Census Bureau.

⁵Free alongside ship (f.a.s.) value.

⁶Customs value.

⁷Production plus imports minus exports. Includes feldspar and imported nepheline syenite.

⁸Feldspar only.

TABLE 2
ESTIMATED FELDSPAR PRODUCTION IN THE UNITED STATES¹

(Thousand metric tons and thousand dollars)

Year	Flotation concentrate		Other ²		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
2014	160 ^r	9,550 ^r	370 ^r	25,300 ^r	530	34,800
2015	120	8,500	410	29,700	520	38,200

^rRevised.

¹Quantity data are rounded to two significant digits, and value data are rounded to three significant digits; may not add to totals shown.

²Includes hand-cobbed feldspar, feldspar content of feldspar-quartz mixtures, and aplite; excludes nepheline syenite.

TABLE 3
U.S. PRODUCERS OF FELDSPAR IN 2015

Company	Location	Product
APAC-Central, Inc.	Muskogee, OK	Feldspar-quartz mixture.
G3 Enterprises Inc.	Byron, CA	Do.
Graniterock Co.	Felton, CA	Do.
Pacer Corp.	Custer, SD	Potassium feldspar.
Quartz Corp., The	Spruce Pine, NC	Sodium-potassium feldspar.
Do.	do.	Sodium-potassium feldspar; feldspar-quartz mixture.
Unimin Corp.	Emmett, ID	Feldspar-quartz mixture.
Do.	Spruce Pine, NC	Sodium-potassium feldspar.
Do.	do.	Sodium-potassium feldspar; feldspar-quartz mixture.
U.S. Silica Holdings, Inc.	Montpelier, VA	Aplite.
Do., do. Ditto.		

TABLE 4
ESTIMATED FELDSPAR SOLD OR USED BY PRODUCERS IN
THE UNITED STATES, BY USE^{1,2}

(Thousand metric tons and thousand dollars)

Use	2014		2015	
	Quantity	Value ¹	Quantity	Value
Glass ³	270	18,700	310	23,500
Ceramics/pottery and miscellaneous	260 ¹	16,100	220	14,700
Total	530 ¹	34,800	520	38,200

¹Revised.

¹Includes hand-cobbed feldspar, flotation-concentrate feldspar, feldspar in feldspar-quartz mixtures, and aplite.

²Quantity data are rounded to two significant digits, and value data are rounded to three significant digits; may not add to totals shown.

³Includes container glass, fiberglass, and other glass.

TABLE 5
U.S. EXPORTS OF FELDSPAR, BY COUNTRY¹

(Metric tons and dollars)

Country	2014		2015	
	Quantity	Value ²	Quantity	Value ²
Brazil	2	6,260	--	--
Canada	2,430	655,000	2,650	798,000
Chile	294	69,100	256	67,300
China	--	--	4	3,060
Colombia	926	205,000	990	200,000
Costa Rica	273	69,200	180	30,100
El Salvador	99	30,800	78	26,900
French Polynesia	--	--	4	5,660
Honduras	--	--	120	38,500
Korea, Republic of	18	14,100	18	8,160
Malaysia	18	8,770	18	8,960
Mexico	46	4,830	45	9,350
Nicaragua	190	29,100	--	--
Norway	8,290	4,030,000	7,420	2,860,000
Panama	220	70,600	160	54,800
Trinidad and Tobago	120	19,900	--	--
Venezuela	3,040	669,000	3,200	804,000
Total	16,000	5,880,000	15,100	4,920,000

-- Zero.

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

²Free alongside ship value.

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF FELDSPAR, BY COUNTRY OF
ORIGIN^{1,2}

(Metric tons and dollars)

Country	2014		2015	
	Quantity	Value ³	Quantity	Value ³
Australia	--	--	9	9,000
China	16	8,670	--	--
Germany	446	180,000	659	230,000
India	774	246,000	532	173,000
Mexico	784	200,000	843	179,000
Norway	5	12,200	--	--
Spain	274	80,300	1,310	343,000
Turkey	5,590	2,380,000	117,000	6,150,000
United Kingdom	20	17,800	--	--
Total	7,910	3,120,000	120,000	7,090,000

-- Zero.

¹Excludes nepheline syenite (mostly from Canada), which is listed in table 1.

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

³Customs value.

Source: U.S. Census Bureau.

TABLE 7
 FELDSPAR: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country and grade ³	2011	2012	2013	2014	2015 ^e
Algeria	148,000	163,000	259,000	230,000	200,000
Argentina	216,721	273,896	226,435	250,000 ^e	220,000
Australia, includes nepheline syenite ^e	50,000	50,000	45,000	45,000	40,000
Austria ^e	27,000	32,000	35,000	35,000	30,000
Brazil, processed, marketable	333,352	247,152	294,357	294,000 ^e	330,000
Chile	7,563	6,399	3,874	4,233	3,014 ⁴
China ^e	2,100,000	2,100,000	2,500,000	2,500,000	2,500,000
Cuba ^e	3,100	3,800	3,200	3,600 ^r	3,300
Czech Republic	407,000	445,000	411,000	422,000	430,000
Ecuador	103,948	152,590	210,142	183,259	200,000
Egypt ^e	210,000	200,000	200,000	200,000	300,000
Ethiopia ^e	441 ⁴	500	530	510	500
Finland	26,292	43,124	47,636	46,233	45,000
Germany ^e	218,000 ⁴	205,000 ⁴	200,000	200,000	200,000
Greece ^e	27,500 ⁴	33,800 ⁴	12,000	10,000	10,000
Guatemala	2,890	19,356	19,611	10,410	10,000
India ⁵	763,263	1,177,702	1,459,008	1,412,518	1,500,000
Indonesia ^e	18,000	19,000	18,000	18,000	18,000
Iran ^e	576,643 ⁴	600,000	1,313,233 ⁴	1,300,000	1,200,000
Italy ^e	4,700,000	4,700,000	4,500,000 ^r	4,500,000 ^r	4,000,000
Japan, includes aplite ^e	104,109 ⁴	100,000	100,000	100,000	100,000
Kenya ^e	35	35	35	40	40
Korea, Republic of	384,221	360,413	343,241	544,058	600,000
Macedonia	36,163	26,506	24,834 ^r	26,156	20,289 ⁴
Malaysia	379,628	482,906	314,000 ^r	378,000 ^r	343,000 ⁴
Mexico	382,497	380,441	164,484	150,726	159,372 ⁴
Morocco ^e	43,889 ⁴	45,000	45,000	45,000	45,000
Nigeria ^e	--	9,080	11,000	12,000	10,000
Norway	25,000	--	--	154,000	100,000
Pakistan ⁶	23,254	53,235	38,218	81,858	50,000
Peru	11,645	26,359	22,695	18,019	20,000
Philippines	22,050	24,969	30,388	34,232	30,000
Poland, run of mine ⁷	550,000	376,500	690,600 ^r	691,000 ^{r,e}	691,000
Portugal	114,600	109,273	70,057	70,865	70,000
Romania ^{e,8}	2,500	6,500	6,800	9,300 ^r	9,100
Russia ^e	400,000	400,000	390,000	400,000	400,000
Saudi Arabia	44,000	227,000	160,000	168,000	150,000
Slovakia ^e	--	--	5,000	6,000	5,000
South Africa	101,559	94,458	191,443	102,541	125,148 ⁴
Spain, includes pegmatite	662,418	530,238	593,000 ^r	533,000 ^r	600,000
Sri Lanka ^e	53,337 ⁴	55,000	57,000	60,000	60,000
Sudan	9,519	26,283	31,700	50,680	30,000
Sweden, salable, crude and ground ^e	30,000	27,000	30,000	27,000	30,000
Thailand	1,041,152	1,100,723	1,072,656	1,413,428	1,331,916 ⁴
Turkey	4,355,003	4,524,943	4,545,197	5,100,000 ^{e,7}	5,000,000
Ukraine	179,000	146,000	134,000	95,000	80,000
United Kingdom, china stone ^e	500	--	--	--	--
United States ^{e,9,10}	580,000	560,000	550,000	530,000	520,000
Venezuela	1,715,000	584,000	580,000	500,000	500,000
Total	21,200,000	20,700,000	22,000,000 ^r	23,000,000 ^r	22,300,000

^eEstimated. ^rRevised. -- Zero.

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

²Includes data available through February 28, 2017.

³In addition to the countries listed, Bulgaria, Burma, Colombia, France, Namibia, the United Arab Emirates, and Yemen may have produced feldspar, but output was not officially reported; and available information was inadequate to make reliable estimates of output.

⁴Reported figure.

⁵Data are for fiscal year ending March 31 of the following year.

⁶Data are for fiscal year ending June 30 of the following year.

TABLE 7—Continued
FELDSPAR: WORLD PRODUCTION, BY COUNTRY^{1, 2}

⁷The dedicated feldspar run of mine production accounts for only part of total feldspar production.

⁸Rounded to two significant digits.

⁹Includes hand-cobbed feldspar, flotation-concentrate feldspar, feldspar in feldspar-quartz mixtures, and aplite.

¹⁰Rounded to two significant digits to avoid disclosing company proprietary data.