



2007 Minerals Yearbook

FELDSPAR AND NEPHELINE SYENITE

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In 2007, U.S. feldspar production, using a combination of reported and estimated data, was 730,000 metric tons (t) valued at about \$44 million. Exports of feldspar decreased by 4% to 9,980 t valued at about \$1.9 million, and imports decreased by 31% to 3,570 t valued at \$0.6 million. U.S. production of nepheline syenite was used as roofing granules and in other construction applications. Imports of nepheline syenite (all from Canada) decreased by 8% to 391,000 t valued at \$39 million. Apparent consumption of feldspar and nepheline syenite combined was 1.1 million metric tons (Mt). World production of feldspar was about 18 Mt.

Feldspar

Production.—Feldspar was mined in seven States, which were, in descending order of estimated output, North Carolina, Virginia, California, Oklahoma, Georgia, Idaho, and South Dakota. North Carolina accounted for at least 45% of the total. Data on domestic production and sales and use of feldspar were collected by the U.S. Geological Survey (USGS) by means of a voluntary survey. Nine U.S. companies mined feldspar and operated 12 beneficiation facilities—4 in North Carolina, 3 in California, and 1 in each of the 5 remaining States (table 3). Of the 12 beneficiation facilities to which survey forms were sent, 8 responded, representing about 76% of the 2007 production tonnages listed in tables 1 and 2. Production for the remaining operations was estimated from prior-year production levels.

Imerys Group of Paris, France, signed a final agreement for the purchase of The Feldspar Corp. (TFC), a subsidiary of Zemex Corp. TFC had two feldspar mine and plant operations, in Georgia and North Carolina (Industrial Minerals, 2007c). Canadian-based i-minerals inc. continued the feasibility study of its Helmer-Bovill industrial mineral property in Latah County, ID. Pilot-plant test work yielded a high-alumina feldspar product with high total alkalis. Quartz product obtained from the feldspar processing was expected to undergo continued high-purity quartz testing (i-minerals inc., 2007).

Consumption.—Feldspar is used in glassmaking, ceramics, and to some extent as a filler and extender in paint, plastics, and rubber. In glassmaking, alumina from feldspar improves product hardness, durability, and resistance to chemical corrosion. In ceramics, the alkalis in feldspar (calcium oxide, potassium oxide, and sodium oxide) act as a flux, lowering the melting temperature of a mixture. Fluxes melt at an early stage in the firing process, forming a glassy matrix that bonds together the other components of the system (Roskill Information Services Ltd., 2002, p. 184, 206). Of the domestic feldspar sold or used, an estimated two-thirds by tonnage went into the manufacture of glass, including glass containers and glass fiber. Pottery (including electrical insulators, sanitaryware, tableware, and

tile) and other uses, such as fillers, accounted for the remainder (table 4). The value of total feldspar sold or used in table 4 is higher than the feldspar production value listed in tables 1 and 2 because table 4 value represents the final marketed feldspar products.

U.S. shipments of glass containers, the leading end use of feldspar, increased slightly in 2007 (U.S. Census Bureau, 2008a). Other feldspar uses included glass fiber for home insulation, sanitaryware, and tile. Because new U.S. housing starts of 1.35 million were 25% lower than in 2006, feldspar consumption in these applications decreased (U.S. Census Bureau, 2008b).

World Review.—Feldspar was produced in more than 50 countries (table 8). Italy was the leading producing country with an estimated 4.2 Mt of feldspathic materials in 2007, followed by Turkey with an estimated 3.8 Mt. China's production was estimated to be about 2 Mt, and Thailand had an estimated output of 1 Mt, most of which was sodium feldspar.

Australia.—At yearend, Monto Minerals, Ltd. was stockpiling feldspar in intermediate form at its Goondicum industrial minerals project in Central Queensland. The company was commissioning a washing facility to reduce the iron content of the feldspar by hot acid leaching. Monto planned to make its first delivery of feldspar for Australian glass manufacture in early 2008 (Monto Minerals Ltd., 2007).

China.—Although China reportedly exported about 1 Mt feldspar in 2007, it apparently consumes a large quantity of the mineral for its domestic ceramics industry (United Nations Statistics Division, undated a). China is the leading producing country of sanitaryware, with an estimated 98 million pieces in 2006 (latest data available), or 36% of the estimated annual world market of 265 million pieces. China exported about one-half of its output (Wilson, 2007a).

Italy.—As the world's leading feldspar producer, Italy's domestic feldspar output supplies the country's ceramics industry. Italy also exported about 227,000 t of feldspar in 2007 and imported about 2.6 Mt, largely from Turkey (United Nations Statistics Division, undated a).

Industrial minerals producer Gruppo Minerali SpA purchased 80% of Maffei SpA for about \$102 million. Both companies were major producers of feldspar (Industrial Minerals, 2007a). Italy is an important producer of sanitaryware and tile. Porcelain tile, which uses a higher proportion of feldspar, than regular tile, remained the leading tile type, accounting for 67% of total Italian tile production (Industrial Minerals, 2007b; Wilson, 2007b).

Russia.—Although the USGS has not received official reports on feldspar production in Russia, one source suggested that production was nearly 660,000 t in 2005 (Magazanik, 2007).

Nepheline Syenite

In glass and ceramics manufacture, nepheline syenite, like feldspar, provides alkalis that act as a flux to lower the melting temperature of a glass or ceramic mixture, prompting faster melting and fuel savings. In glass, nepheline syenite also supplies alumina, which gives improved thermal endurance, increased chemical durability, and increased resistance to scratching and breaking.

No nepheline syenite was produced in the United States for ceramic, glass, or filler use. In Arkansas, nepheline syenite with a higher iron content was produced for use in roofing granules, road materials, asphalt and concrete aggregate, and related products.

World Review.—Canada.—Canada's sole nepheline syenite producer, Unimin Canada, Ltd., operated two plants at its Blue Mountain, Ontario, deposit, about 175 kilometers northeast of Toronto. Production of marketable nepheline syenite was an estimated 720,000 t in 2007. Detailed end-use data in recent years have not been available, but historically, consumption has been in glass, ceramics, and pigments and fillers. Total Canadian nepheline syenite exports were about 508,000 t in 2007. The leading recipients were the United States, with 391,000 t; Italy, 45,000 t; the Netherlands, 31,000 t; and Spain, 25,000 t (United Nations Statistics Division, undated b).

Norway.—North Cape Minerals AS produced nepheline syenite from an underground mine on the arctic island of Stjernoya; output was 330,000 t in 2006 (British Geological Survey, 2008, p. 63). End-use data for this material have not been available in recent years, but uses in the past included glass (including amber glass), ceramics, and fillers. In 2007, total exports from Norway were 312,000 t. Leading recipients included Poland, with about 75,000 t; the Netherlands, 61,000 t; the United Kingdom, 50,000 t; Germany, 41,000 t; and Spain, 25,000 t (United Nations Statistics Division, undated b).

Outlook

Producers of feldspar and nepheline syenite face continuing challenges related to the cost of energy in 2008, including natural gas and electric power. In addition, higher transportation charges for shipping feldspathic products by rail and truck in 2008 will increase delivered raw material costs for industrial consumers (Rogers, 2008).

According to the Freedomia Group, Inc., U.S. food container demand may rise modestly during the next few years increasing feldspar consumption in glass containers. Competition, however, could continue to come from plastic and other containers (Sutton, 2007). If new U.S. residential housing construction continues to lag in 2008, lower demand could result for materials and components that use feldspar. Commercial and residential remodeling could partially help to offset the reduced demand (Rogers, 2008).

Globally, the ceramic tile industry is said to be growing and with it, the use of feldspar. The four leading tile producing countries have been China, Spain, Italy, and Brazil. Although consuming much of its output internally, China could become an increasingly important exporter of ceramic tile. India, currently

with a low per capita consumption of tiles, could become a more significant importer (Stentiford, 2007).

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TABLE 1
SALIENT FELDSPAR AND NEPHELINE SYENITE STATISTICS¹

		2003	2004	2005	2006	2007
United States:						
Produced, feldspar:						
Quantity ^{e, 2, 3}	metric tons	800,000	770,000	750,000	760,000	730,000
Value ^{e, 2}	thousands	\$43,400	\$44,200	\$42,700	\$44,600	\$43,800
Exports, feldspar: ⁴						
Quantity	metric tons	8,950	9,630	15,200	10,400	9,980
Value ⁵	thousands	\$1,310	\$1,420	\$2,070	\$1,930	\$1,950
Imports for consumption ⁴						
Feldspar:						
Quantity	metric tons	7,980	20,600	26,200	5,180	3,570
Value ⁶	thousands	\$1,020	\$944	\$1,700	\$549	\$642
Nepheline syenite: ⁷						
Quantity	metric tons	308,000	350,000	340,000	426,000	391,000
Value ⁶	thousands	\$28,200	\$29,041	\$33,800	\$36,000	\$38,900
Consumption, apparent ^{e, 8}	thousand metric tons	1,110	1,130	1,100	1,180	1,110
World, production ⁹	do.	13,600 ^r	15,100 ^r	16,200 ^r	17,600 ^r	18,105 ^e

^eEstimated. ^rRevised. do. Ditto.

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

²Includes hand-cobbed feldspar, flotation-concentrate feldspar, feldspar in feldspar-quartz mixtures, and aplite; may differ from sales in table 4.

³Rounded to two significant digits.

⁴Source: U.S. Census Bureau.

⁵Free alongside ship (f.a.s.) value.

⁶Customs value.

⁷No nepheline syenite produced in the United States for glass and ceramic use.

⁸Production plus imports minus exports. Includes feldspar and nepheline syenite.

⁹Feldspar only.

TABLE 2
ESTIMATED FELDSPAR PRODUCTION IN THE UNITED STATES

(Thousand metric tons and thousand dollars)

Year	Flotation concentrate		Other ¹		Total	
	Quantity ²	Value	Quantity ²	Value	Quantity ²	Value
2006	340	19,200 ^r	430	25,400 ^r	760	44,600 ^r
2007	330	18,500	400	25,300	730	43,800

^rRevised.

¹Includes hand-cobbed feldspar, feldspar content of feldspar-quartz mixtures, and aplite; excludes nepheline syenite.

²Data are rounded to two significant digits; may not add to totals shown.

TABLE 3
U.S. PRODUCERS OF FELDSPAR IN 2007

Company	Location	Product
APAC Arkansas, Inc.	Muskogee, OK	Feldspar-quartz mixture.
Feldspar Corp.,The	Monticello, GA	Potassium feldspar.
Do.	Spruce Pine, NC	Sodium-potassium feldspar.
Graniterock Co.	Felton, CA	Feldspar-quartz mixture.
Kings Mountain Minerals Inc.	Kings Mountain, NC	Do.
K-T Feldspar Corp.	Spruce Pine, NC	Sodium-potassium feldspar; feldspar-quartz mixture.
Pacer Corp.	Custer, SD	Potassium feldspar.
P.W. Gillibrand Co., Inc.	Simi Valley, CA	Feldspar-quartz mixture.
Unimin Corp.	Byron, CA	Do.
Do.	Emmett, ID	Do.
Do.	Spruce Pine, NC	Sodium-potassium feldspar.
U.S. Silica Co.	Montpelier, VA	Aplite.
Do. Ditto.		

TABLE 4
ESTIMATED FELDSPAR SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE¹

(Thousand metric tons and thousand dollars)

Use	2006		2007	
	Quantity ²	Value ^r	Quantity ²	Value
Glass ³	480	28,100	480	29,400
Pottery and miscellaneous	280	19,300	250	18,300
Total	760	47,400 ⁴	730	47,700 ⁴

^rRevised.

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

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

³Includes container glass, glass fiber, and other glass.

⁴Represents final marketable product; value higher than that listed in tables 1 and 2.

TABLE 5
PRICES FOR U.S. FELDSPAR, YEAREND 2007

(Dollars per metric ton)

	Price ¹
Ceramic grade:	
170 to 200 mesh, sodium	66–83
200 mesh, potassium	138
Glass grade:	
30 mesh, sodium	44–57
80 mesh, potassium	94–99

¹Bulk, ex-works, United States.

Source: Industrial Minerals, no. 483, December 2007, p. 76.

TABLE 6
U.S. EXPORTS OF FELDSPAR, BY COUNTRY¹

(Metric tons and dollars)

Country	2006		2007	
	Quantity	Value ²	Quantity	Value ²
Canada	1,150	267,000	1,150	278,000
Colombia	1,490	379,000	2,510	542,000
Costa Rica	1,900	264,000	2,170	303,000
Dominican Republic	300	53,900	17	4,620
Guatemala	549	74,500	392	53,300
Italy	1,790	356,000	1,150	293,000
Mexico	639	109,000	247	62,000
Nicaragua	2,060	303,000	1,890	263,000
Trinidad and Tobago	195	44,900	237	54,900
Venezuela	65	23,500	154	37,000
Other	217 ^r	60,200 ^r	64	57,600
Total	10,400	1,930,000	9,980	1,950,000

^rRevised.

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 7
U.S. IMPORTS FOR CONSUMPTION OF FELDSPAR, BY COUNTRY^{1,2}

(Metric tons and dollars)

Country	2006		2007	
	Quantity	Value ³	Quantity	Value ³
Canada	--	--	837	231,000
Mexico	5,100	507,000	2,670	370,000
Other	78	41,600	61	40,400
Total	5,180	549,000	3,570	642,000

-- Zero.

¹Excludes nepheline syenite, 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 8
FELDSPAR: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2003	2004	2005	2006	2007 ^c
Argentina	90,854	125,684	151,307	170,728 ^r	170,000
Australia, includes nepheline syenite ^c	50,000	50,000	50,000	50,000	50,000
Brazil, processed, marketable	58,976	121,452	122,887	123,000 ^e	125,000
Bulgaria	35,000 ^e	86,608 ^r	72,867 ^r	93,091 ^r	90,000
Burma ^{e,4}	10,000	10,000	10,000	10,000	10,000
Chile	6,690	4,838	5,820	5,847 ^r	6,000
China ^e	1,700,000	1,800,000	1,850,000	1,950,000 ^r	2,000,000
Colombia ^e	100,000	100,000	100,000	100,000	100,000
Cuba ^e	7,200	10,500	8,000	5,500 ^r	6,000
Czech Republic	421,000	488,000	472,000	487,000 ^r	490,000
Ecuador	44,268	53,469	38,250	67,844 ^r	68,000
Egypt ^e	350,000	350,000	350,000	350,000	350,000
Ethiopia ⁵	208	361	445	478	480
Finland	48,353	57,149	60,000	60,000 ^e	60,000
France, crude ^e	650,000	650,000	650,000	650,000	650,000
Germany	233,028	182,842	168,640	167,332	171,303 ⁶
Greece ^e	95,000	95,000	95,000	95,000	95,000
Guatemala	9,320	4,473	3,808	17,176 ^r	17,200
India ^e	150,000	150,000	150,000	160,000	160,000
Iran	242,898	252,713	250,000 ^e	250,000 ^e	260,000
Italy	2,343,722 ^r	3,251,264 ^r	3,995,233 ^r	4,019,495 ^r	4,200,000
Japan, includes apfite ^e	1,010,000	900,000	800,000 ^r	800,000 ^r	750,000
Jordan	13,057	13,063	1,000 ^r	11,054 ^r	11,000
Kenya ^e	50	40	22	25 ^r	25
Korea, Republic of	477,012	541,788	508,644	427,378 ^r	398,513 ⁶
Macedonia	21,000	21,000 ^{r,e}	27,076 ^r	38,124 ^r	40,000
Madagascar ^e	3	3	3	3	3
Malaysia	42,662	79,220	117,180 ^r	142,358 ^r	150,000
Mexico	346,315	364,315	349,109	459,209 ^r	460,000
Morocco ^e	20,000	20,000	20,000	20,000	20,000
Nigeria ^e	1,800	1,700	1,700	1,700	1,700
Norway ^e	74,000	75,000	76,000	75,000	75,000
Pakistan	37,344	30,373	25,032	24,000 ^e	22,000
Peru	7,349	6,005	6,000	6,010 ^{r,e}	6,050
Philippines ^e	30,000	32,110 ⁶	11,850 ⁶	12,000	12,000
Poland ⁷	289,000 ^r	336,900 ^r	350,000 ^{r,e}	350,000 ^r	350,000
Portugal	126,116	98,262	133,344	129,333 ^r	129,500 ^{p,6}
Romania	71,717	60,924	74,920 ^r	37,553 ^r	35,000
Russia ^e	45,000	45,000	45,000	45,000	45,000
Serbia	7,813 ^{r,8}	3,045 ^{r,8}	3,500 ^{r,8}	3,500 ^{r,e}	3,500
Slovakia ^e	5,000	5,000	5,000	5,000	5,000
South Africa	57,738	53,721	57,534	76,722 ^r	90,232 ^{p,6}
Spain, includes pegmatite	563,580	552,507	580,000	580,000	600,000
Sri Lanka	32,586	33,000 ^e	34,000	35,000	36,000
Sweden, salable, crude and ground ^c	41,000	42,000	43,000	42,000	42,000
Thailand	824,990	1,001,053	1,149,717 ^r	1,067,684 ^r	1,000,000
Turkey	1,862,310	1,983,336	2,200,000	3,400,000 ^{r,e}	3,800,000
United Kingdom, china stone	2,865	2,274	1,835 ^r	2,000 ^{r,e}	2,000

See footnotes at end of table.

TABLE 8—Continued
 FELDSPAR: WORLD PRODUCTION, BY COUNTRY^{1,2}
 (Metric tons)

Country ³	2003	2004	2005	2006	2007 ^e
United States	800,000 ⁹	770,000 ⁹	750,000 ^{r,9}	760,000 ^{r,9}	730,000 ^{6,9}
Uruguay	2,450	2,450	2,150	2,470 ^r	2,500 ^p
Uzbekistan ^c	4,300	4,300	4,300	4,300	4,300
Venezuela	149,000	176,000	202,000	200,000 ^e	200,000
Zimbabwe	816	1	--	--	--
Total	13,600,000 ^r	15,100,000 ^r	16,200,000 ^r	17,600,000 ^r	18,100,000

^eEstimated. ^pPreliminary. ^rRevised. -- Zero.

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

²Table includes data available through May 23, 2008.

³In addition to the countries listed, Namibia, the United Arab Emirates, and Yemen may produce feldspar, but output is not officially reported; available general information is inadequate for the formulation of reliable estimates of output levels.

⁴Data are for fiscal years beginning April 1 of year stated.

⁵Data are for fiscal years ending July 7 of year stated.

⁶Reported figure.

⁷Of the amounts shown, the dedicated feldspar mine production accounts for only part of total feldspar production.

⁸Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

⁹Rounded to two significant digits.