

FLUORSPAR

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2016, minimal fluor spar (calcium fluoride, CaF₂) was produced in the United States. One company sold fluor spar from stockpiles produced as a byproduct of its limestone quarrying operation in Cave-in-Rock, IL. The same company also continued development work and stockpiling of ore for future processing at the Klondike II fluor spar mine in Kentucky. Synthetic fluor spar may have been recovered as a byproduct of petroleum alkylation, stainless steel pickling, and uranium processing, but no data were collected from any of these operations.

U.S. fluor spar consumption was satisfied by imports and small amounts of byproduct synthetic fluor spar. Domestically, production of hydrofluoric acid (HF) in Louisiana and Texas was by far the leading use for acid-grade fluor spar. HF is the primary feedstock for the manufacture of virtually all fluorine-bearing chemicals and is also a key ingredient in the processing of aluminum and uranium. Fluor spar was also used in cement production, in enamels, as a flux in steelmaking, in glass manufacture, in iron and steel casting, and in welding rod coatings.

An estimated 64,500 tons of fluorosilicic acid (FSA), equivalent to about 105,000 tons of fluor spar grading 100%, was recovered from five phosphoric acid plants processing phosphate rock. FSA was used primarily in water fluoridation.

Salient Statistics—United States:	2012	2013	2014	2015	2016^e
Production:					
Finished, all grades	NA	NA	NA	NA	NA
Fluor spar equivalent from phosphate rock	120	121	114	105	105
Imports for consumption:					
Acid grade	464	512	291	328	350
Metallurgical grade	156	130	123	48	54
Total fluor spar imports	620	643	414	376	404
Hydrofluoric acid	133	119	125	120	128
Aluminum fluoride	50	43	38	32	19
Cryolite	8	19	16	19	16
Exports	24	16	13	14	13
Consumption:					
Apparent ¹	525	548	518	411	401
Reported	416	441	W	W	W
Price,² acid grade, yearend, dollars per ton:					
Filtercake	400–450	350	290–330	260–280	260–280
Arsenic <5 parts per million	540–550	540–550	370–420	280–310	280–310
Stocks, yearend, consumer and dealer ³	234	313	^e 195	^e 146	136
Employment, mine, number ^e	5	6	6	5	4
Net import reliance ⁴ as a percentage of apparent consumption	100	100	100	100	100

Recycling: Synthetic fluor spar may be produced from neutralization of waste in the enrichment of uranium, petroleum alkylation, and stainless steel pickling; however, undesirable impurities constrain usage. Primary aluminum producers recycle HF and fluorides from smelting operations.

Import Sources (2012–15): Mexico, 72%; China, 9%; South Africa, 9%; Mongolia, 4%; and other, 6%.

Tariff: Item	Number	Normal Trade Relations 12–31–16
Metallurgical grade (less than 97% CaF ₂)	2529.21.0000	Free.
Acid grade (97% or more CaF ₂)	2529.22.0000	Free.
Natural cryolite	2530.90.1000	Free.
Hydrogen fluoride (hydrofluoric acid)	2811.11.0000	Free.
Aluminum fluoride	2826.12.0000	Free.
Synthetic cryolite	2826.30.0000	Free.

Depletion Allowance: 22% (Domestic), 14% (Foreign).

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Government Stockpile: None.

Events, Trends, and Issues: The Frank R. Lautenberg Chemical Safety for the 21st Century Act was signed into law in June. The law amends The Toxic Substances Control Act of 1976 and all new and existing chemicals will be subject to a safety review by the Environmental Protection Agency, which will further prioritize potentially harmful chemicals for full, risk-based assessment.

Prolonged adverse market conditions have affected numerous mining projects. In the past several years, mines in Bulgaria, Kenya, Namibia, Russia, and South Africa have been put on care-and-maintenance status or permanently closed. However, one project in Canada began mine construction in 2016 with mining anticipated to begin in 2017. Another company announced its intention to construct a new manufacturing facility to produce hydrofluoroolefin HFO-1234yf in Texas. The facility, expected to begin production in late 2018, will triple production capacity of this chemical, which has a low global-warming potential and is used as a refrigerant in automotive air-conditioning and other applications.

World Mine Production and Reserves: Production estimates for individual countries were made using country or company-specific data whenever available; other estimates were made based on general knowledge of end-use markets. Reserves data for China were revised based on data from the National Bureau of Statistics China.

	Mine production		Reserves ^{5, 6}
	2015	2016 ^e	
United States	NA	NA	4,000
China	4,400	4,200	40,000
Germany	40	60	NA
Iran	80	80	3,400
Kazakhstan	110	110	NA
Kenya	63	20	5,000
Mexico	1,030	1,000	32,000
Mongolia	231	230	22,000
Morocco	79	75	580
South Africa	135	180	41,000
Spain	98	95	6,000
Thailand	50	50	NA
United Kingdom	81	40	NA
Vietnam	168	170	NA
Other countries	109	89	110,000
World total (rounded)	6,670	6,400	260,000

World Resources: Identified world fluor spar resources were approximately 500 million tons of contained fluor spar. Additionally, enormous quantities of fluorine are present in phosphate rock. Current U.S. reserves of phosphate rock are estimated to be 1.1 billion tons, containing about 79 million tons of 100% fluor spar equivalent. World reserves of phosphate rock are estimated to be 68 billion tons, equivalent to about 4.9 billion tons of 100% fluor spar equivalent.

Substitutes: FSA is used to produce aluminum fluoride (AlF₃), but because of differing physical properties, AlF₃ produced from FSA is not readily substituted for AlF₃ produced from fluor spar. FSA has been used to produce HF, but this practice has not been widely adopted. Aluminum smelting dross, borax, calcium chloride, iron oxides, manganese ore, silica sand, and titanium dioxide have been used as substitutes for fluor spar fluxes.

^eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data.

¹Excludes fluor spar production withheld to avoid disclosing company proprietary data and fluor spar equivalent of fluorosilicic acid, HF, and cryolite.

²Free on board, Tampico, Mexico. Source: Industrial Minerals.

³Industry stocks for leading consumers and fluor spar distributors.

⁴Defined as imports – exports + adjustments for industry stock changes.

⁵See [Appendix C](#) for resource and reserve definitions and information concerning data sources.

⁶Measured as 100% calcium fluoride.