

FLUORSPAR

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2015, 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 supplied 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 70,000 tons of fluorosilicic acid (equivalent to about 114,000 tons of fluor spar grading 100%) was recovered from five phosphoric acid plants processing phosphate rock. Fluorosilicic acid was used primarily in water fluoridation.

Salient Statistics—United States:	2011	2012	2013	2014	2015^e
Production:					
Finished, all grades	NA	NA	NA	NA	NA
Fluor spar equivalent from phosphate rock	114	120	121	114	114
Imports for consumption:					
Acid grade	560	464	512	291	330
Metallurgical grade	167	156	130	123	60
Total fluor spar imports	727	620	643	414	390
Hydrofluoric acid	132	133	119	125	131
Aluminum fluoride	41	50	43	38	38
Cryolite	10	8	19	16	20
Exports	24	24	16	13	15
Consumption:					
Reported	456	416	441	W	W
Apparent ¹	672	525	548	518	440
Price,² acid grade, yearend, dollars per ton:					
Filtercake	400–450	400–450	350	290–330	290–330
Arsenic <5 parts per million	540–550	540–550	540–550	370–420	370–420
Stocks, yearend, consumer and dealer ³	162	234	313	196	130
Employment, mine, number ^e	11	5	6	6	5
Net import reliance ⁴ as a percentage of apparent consumption	100	100	100	100	100

Recycling: A few thousand tons per year of synthetic fluor spar are recovered—primarily from uranium enrichment, but also from petroleum alkylation and stainless steel pickling. Primary aluminum producers recycle HF and fluorides from smelting operations. HF is recycled in the petroleum alkylation process.

Import Sources (2011–14): Mexico, 76%; China, 11%; South Africa, 8%; Mongolia, 3%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12–31–15
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).

Government Stockpile: None.

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Events, Trends, and Issues: The weak fluorspar market that began in 2011 and was attributed to oversupply in fluorspar and excess downstream fluorochemical production saw little improvement in 2015. Prices, particularly for acid-grade fluorspar from China, remained low. Prolonged adverse market conditions have affected numerous mining projects. In the past several years, mines in India, Namibia, Russia, and South Africa have been put on care-and-maintenance status or permanently closed. Exploration and development projects have been abandoned or experienced significant delays. However, one new mine, a polymetallic project in Vietnam that began producing fluorspar in 2014, continued to ramp up production in 2015.

Another factor creating uncertainty in the fluorspar market is increased regulation of fluorinated gases, such as refrigerants, aerosols, and foam-blowing agents, particularly in Europe and North America. Earlier generations of these substances, which include chlorofluorocarbons and hydrochlorofluorocarbons, had been targeted for either reduction in use or complete phaseout under the Montreal Protocol on Substances that Deplete the Ozone Layer because of their ozone-depleting potential. In 2014 and 2015, however, the European Union and the United States introduced new measures to decrease reliance on many hydrofluorocarbons (HFCs) as well. Although HFCs do not deplete the ozone, environmental concerns are now focused on their global-warming potential.

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.

	Mine production		Reserves ^{5, 6}
	2014	2015 ^e	
United States	NA	NA	4,000
China	3,800	3,800	24,000
Germany	60	60	NA
Iran	90	90	3,400
Kazakhstan	110	110	NA
Kenya	70	63	5,000
Mexico	1,110	1,100	32,000
Mongolia	375	375	22,000
Morocco	75	75	580
Namibia	65	—	NA
South Africa	285	200	41,000
Spain	98	95	6,000
United Kingdom	77	70	NA
Other countries	177	210	110,000
World total (rounded)	6,390	6,250	250,000

World Resources: Identified world fluorspar resources were approximately 500 million tons of contained fluorspar. 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% fluorspar equivalent. World reserves of phosphate rock are estimated to be 69 billion tons, equivalent to about 4.8 billion tons of 100% fluorspar equivalent.

Substitutes: Fluorosilicic acid has been used as a substitute in aluminum fluoride production and also has the potential to be used as a substitute in HF production. However, these practices have not been adopted in the United States. Aluminum smelting dross, borax, calcium chloride, iron oxides, manganese ore, silica sand, and titanium dioxide have been used as substitutes for fluorspar fluxes.

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

¹Excludes fluorspar production, withheld for proprietary reasons, and fluorspar equivalent of fluorosilicic acid, HF, and cryolite.

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

³Industry stocks for leading consumers and fluorspar distributors.

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

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

⁶Measured as 100% calcium fluoride.