

FLUORSPAR

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2020, 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, and continued development on its fluor spar mine in Kentucky. After acquiring a fluor spar mine in Utah, a second company continued a drilling program to further define the mineral resource and facilitate development of a mine plan. An estimated 29,000 tons of fluorosilicic acid (FSA), equivalent to about 47,000 tons of fluor spar grading 100%, was recovered from five phosphoric acid plants processing phosphate rock, which was primarily used in water fluoridation. The U.S. Department of Energy continued to produce aqueous hydrofluoric acid (HF) as a byproduct of the conversion of depleted uranium hexafluoride to depleted uranium oxide at plants in Paducah, KY, and Portsmouth, OH.

U.S. fluor spar consumption was satisfied primarily by imports. Domestically, production of HF in Louisiana and Texas was by far the leading use for acid-grade fluor spar. Hydrofluoric acid is the primary feedstock for the manufacture of virtually all fluorine-bearing chemicals, particularly refrigerants and fluoropolymers, 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.

Salient Statistics—United States:	2016	2017	2018	2019	2020^e
Production:					
Finished, metallurgical grade	NA	NA	NA	NA	NA
Fluorosilicic acid from phosphate rock	44	40	33	29	29
Imports for consumption:					
Acid grade	328	331	381	317	320
Metallurgical grade	<u>55</u>	<u>70</u>	<u>78</u>	<u>59</u>	<u>70</u>
Total fluor spar imports	383	401	459	376	390
Hydrofluoric acid	126	123	122	124	110
Aluminum fluoride	20	21	26	37	22
Cryolite	16	10	17	21	24
Exports, fluor spar, all grades ¹	12	11	9	8	8
Consumption:					
Apparent ²	371	390	450	368	380
Reported	W	W	W	W	W
Price, average value of imports, cost, insurance, and freight, dollars per ton:					
Acid grade	273	267	276	324	320
Metallurgical grade	233	237	258	292	160
Stocks, consumer and dealer, ³ yearend	^e 147	NA	NA	NA	NA
Employment, mine, number ^e	13	16	16	16	19
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 use. Primary aluminum producers recycle HF and fluorides from smelting operations.

Import Sources (2016–19): Mexico, 70%; Vietnam, 9%; China, 8%; South Africa, 7%; and other, 6%.

Tariff:	Item	Number	Normal Trade Relations 12–31–20
	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 global availability of fluorspar was estimated to have increased in 2020 owing to decreased consumption in some downstream applications and continued rampup of new mines in Canada and South Africa. On the consumption side, an increasing number of new projects continued to focus on developing alternatives to fluorspar in the manufacture of HF. Hydrofluoric acid was produced from FSA at four plants in China and a fifth plant was ramping up production in 2020. In June, a leading domestic fluorochemical producer and leading phosphoric acid producer announced a partnership to construct a 40,000-ton-per-year anhydrous HF plant in Aurora, NC, using FSA feedstock. The new plant, expected to begin production in 2022, would be the first plant of its kind outside of China, although similar projects were reportedly being evaluated in other countries. The agreement established a long-term HF supply agreement which would support production of fluorogases and fluoropolymers in Calvert City, KY. The capacity of existing U.S. HF plants that use fluorspar as a feedstock was 220,000 tons per year.

World Mine Production and Reserves: Reserves for Morocco were revised based on company-reported information but were only available for one producer.

	Mine production		Reserves ^{5, 6}
	2019	2020 ^e	
United States	NA	NA	4,000
Burma	53	53	NA
Canada	80	100	NA
China	74,300	74,300	42,000
Germany	50	50	NA
Iran	55	55	3,400
Kazakhstan	88	77	NA
Mexico	1,230	1,200	68,000
Mongolia	718	720	22,000
Morocco	88	88	210
Pakistan	100	100	NA
South Africa	210	320	41,000
Spain	139	140	10,000
Vietnam	238	240	5,000
Other countries	107	110	120,000
World total (rounded)	7,460	7,600	320,000

World Resources:⁵ Large quantities of fluorine are present in phosphate rock. Current U.S. reserves of phosphate rock are estimated to be 1 billion tons, containing about 72 million tons of 100% fluorspar equivalent assuming an average fluorine content of 3.5% in the phosphate rock. World reserves of phosphate rock are estimated to be 71 billion tons, equivalent to about 5 billion tons of 100% fluorspar equivalent.

Substitutes: FSA is used to produce aluminum fluoride (AlF₃) and HF. Because of differing physical properties, AlF₃ produced from FSA is not readily substituted for AlF₃ produced from fluorspar. 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.

¹Includes data for the following Schedule B codes: 2529.21.0000 and 2829.22.0000.

²Defined as total fluorspar imports – exports.

³Industry stocks for leading consumers and fluorspar distributors.

⁴Defined as imports – exports.

⁵See Appendix C for resource and reserve definitions and information concerning data sources.

⁶Measured as 100% calcium fluoride.

⁷As reported by China's Ministry of Natural Resources. Likely excludes production from operations that did not meet the Government's minimum mining and processing requirements. The China Non-Metallic Minerals Industry Association estimated that actual production was closer to 6 million tons.