

Mineral Industry Surveys

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FLUORSPAR IN THE FOURTH QUARTER 2023

Fluorspar imports in the fourth quarter of 2023 were 135,000 metric tons (t), 129,000 t of which were acid grade and 6,170 t of which were metallurgical grade (fig. 1, table 1). In terms of quantity, acid-grade imports increased by 48% compared with those in the previous quarter and by 22% compared with imports in the fourth quarter of 2022. The leading sources of acid-grade imports during the fourth quarter were, in descending order of quantity, Mexico (58%), Vietnam (20%), and South Africa (15%). Imports of metallurgical-grade fluorspar increased by 88% compared with those in the previous quarter and decreased by 79% compared with imports in the fourth quarter of 2022. In the fourth quarter Mexico was the source of 99% of metallurgical-grade imports, with the remainder imported from Mongolia (table 2).

Total imports of fluorspar in 2023 were 417,000 t, 382,000 t of which were acid grade and 34,700 t of which were metallurgical grade. Acid- and metallurgical-grade imports each decreased compared with those in 2022, by 13% and 61%, respectively (table 1). Mexico continued to be the leading source of acid-grade and metallurgical-grade imports, accounting for 64% of acid-grade imports and 60% of metallurgical-grade imports in 2023 (table 2).

In the fourth quarter of 2023, imports of other fluorine-containing materials produced directly from fluorspar were 13,700 t hydrofluoric acid, 6,970 t cryolite, and 6,860 t aluminum fluoride. For the full year 2023, imports of these materials were 86,800 t hydrofluoric acid, 32,300 t cryolite, and 25,200 t aluminum fluoride (table 1). Mexico was the leading supplier of hydrofluoric acid, accounting for 75% of imports in the fourth quarter of 2023, and 86% for the full year (table 3). Exports of acid- and metallurgical-grade fluorspar, aluminum fluoride, and cryolite were likely re-exports as there is no domestic production (table 1).

In the fourth quarter of 2023, the quarterly average unit value of acid-grade imports was \$414 per metric ton, an increase of 8% compared with the 2022 annual average unit value of \$384 per metric ton. The quarterly average unit value of acid-grade imports from Mexico was \$424 per metric ton, a 17% increase compared with the annual average unit value of \$362 per metric ton in 2022. The estimated quarterly average unit value of acid-grade imports from Vietnam was \$316 per metric ton, an increase of 3% compared with the annual

estimated average import value of \$307 per metric ton in 2022. The quarterly average unit value of acid-grade imports from South Africa was \$455 per metric ton, an increase of 31% compared with the 2022 annual average unit value of \$347 per metric ton (table 2).

The quarterly average unit value of metallurgical-grade imports was \$134 per metric ton, a 40% decrease compared with the 2022 annual average unit value of \$223 per metric ton. The quarterly average unit value of metallurgical-grade imports from Mexico was \$128 per metric ton, a 17% increase compared with the annual average unit value of \$109 per metric ton in 2022. The quarterly average unit value of metallurgical-grade imports from Mongolia was \$662 per metric ton, a 12% increase compared with \$590 per metric ton in 2022 (table 2).

Legislation and Government Programs

In October, the U.S. Environmental Protection Agency issued a final rule that restricted the use of hydrofluorocarbons (HFCs) under the American Innovation and Manufacturing Act of 2020. This rule restricted the use of HFCs with high global warming potential (GWP) in over 40 subsectors including aerosol, air conditioning, heat pump foam, and refrigeration. The compliance dates for these restrictions varied depending on the subsector and ranged from January 1, 2025, to January 1, 2028. This ruling also prohibited the manufacture, import, and installation of factory-completed products that used higher-GWP HFCs. Additionally, it established a process for submitting technology transition petitions accompanied by recordkeeping and reporting requirements (Environmental Protection Agency, 2023).

In December, the Government of Australia expanded its critical minerals list to include fluorine. The updated list also included arsenic, molybdenum, selenium, and tellurium. According to the Government of Australia, the list contains minerals important to modern technologies, economies, and national security that are in demand and vulnerable to supply chain disruption (Department of Industry, Science and Resources, 2023).

Industry News

In November, Orbia Advance Corp., S.A.B. de C.V., and Solvay S.A. finalized their joint venture agreement to create the largest polyvinylidene fluoride (PVDF) production facility in North America. PVDF is a lithium-ion binder and separation coating used in electric vehicle batteries. Orbia's Fluorinated Solutions, known commercially as Koura, will supply the critical minerals and intermediate materials, from which Solvay will manufacture the suspension-grade PVDF. Solvay's PVDF production facility will be in Augusta, GA, and was anticipated to be operational by 2026. Orbia also announced plans to build a second site at its existing facility in Louisiana that would have a production capacity of 40,000 metric tons per year (t/yr) of R-142b, a key HFC refrigerant used in the manufacture of PVDF. Construction of Orbia's new facility was projected to begin in 2025 and it would be operational by 2026 (Louisiana Economic Development, 2023; Orbia Advance Corp., S.A.B. de C.V., 2023a).

In December, Orbia rebranded its Fluorinated Solutions business group, Koura, to Orbia Fluor & Energy Materials. The name change followed several key milestones, including the joint venture agreement with Solvay in November 2023 and a \$100 million dollar grant from the U.S. Department of Energy for the development of a lithium hexafluorophosphate (LiPF₆) plant in 2022. The project was anticipated to be operational by 2026 and will be the first LiPF₆ manufacturing site in North America with a production capacity of 10,000 t/yr of battery-grade electrolyte salts (Orbia Advance Corp., S.A.B. de C.V., 2023b, c).

Environmental Protection Agency, 2023, Phasedown of hydrofluorocarbons—Restrictions on the use of certain hydrofluorocarbons under the American Innovation and Manufacturing Act of 2020: Federal Register, v. 88, no. 204, October 24, p. 73098–73212. (Accessed March 22, 2024, at <https://www.govinfo.gov/content/pkg/FR-2023-10-24/pdf/2023-22529.pdf>.)

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Department of Industry, Science and Resources, 2023, Updates to Australia's critical minerals list: Canberra, Australian Capital Territory, Australia, Department of Industry, Science and Resources, December 16. (Accessed March 15, 2023, at <https://www.industry.gov.au/news/updates-australias-critical-minerals-list>.)

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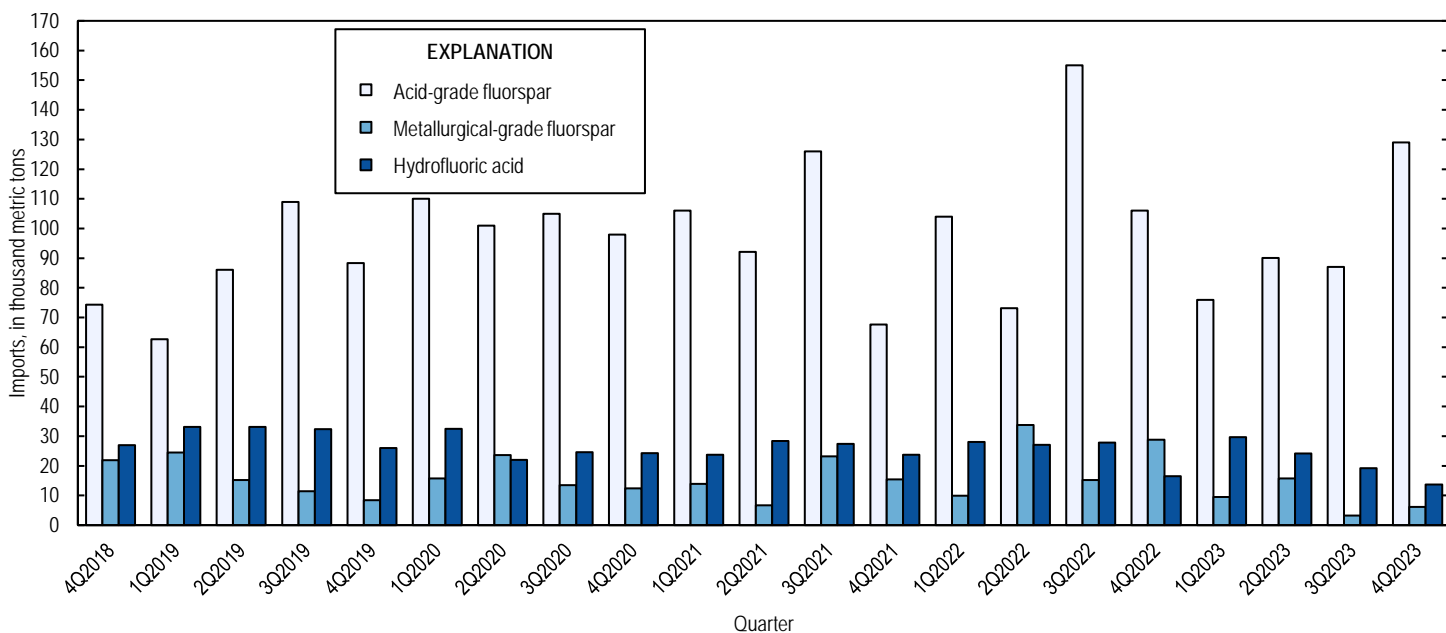


Figure 1. Acid-grade fluorspar, metallurgical-grade fluorspar, and hydrofluoric acid imports from the fourth quarter of 2018 through the fourth quarter of 2023. Source: U.S. Census Bureau and U.S. Geological Survey.

TABLE 1
SALIENT FLUORSPAR STATISTICS¹

(Metric tons)

	2023						
	4th quarter	1st quarter– 4th quarter	1st quarter	2d quarter	3d quarter	4th quarter	1st quarter– 4th quarter
Production, fluorspar	--	--	--	--	--	--	--
Imports for consumption: ²							
Fluorspar:							
Acid grade, more than 97% calcium fluoride	106,000	438,000	75,900	90,100	87,100	129,000	382,000
Metallurgical grade, less than 97% calcium fluoride	28,800	87,800	9,490	15,700	3,280	6,170	34,700
Total	135,000	526,000	85,400	106,000	90,400	135,000	417,000
Hydrofluoric acid	16,500	99,400	29,700	24,200	19,200	13,700	86,800
Aluminum fluoride	5,010	21,200	6,930	6,020	5,430	6,860	25,200
Cryolite	6,470	27,800	7,820	8,210	9,290	6,970	32,300
Exports: ²							
Fluorspar:							
Acid grade, more than 97% calcium fluoride	3,260	15,000	3,510	2,910	3,850	3,150	13,400
Metallurgical grade, less than 97% calcium fluoride	1,610	9,000	1,400	2,020	1,600	1,730	6,740
Total	4,880	24,000	4,910	4,930	5,440	4,880	20,200
Hydrofluoric acid	2,950	9,890	1,620	2,750	2,710	3,390	10,500
Aluminum fluoride	20	31	3	7	(⁴)	44	54
Cryolite	1,280	11,100	1,000	1,030	1,370	1,740	5,150
Apparent consumption, fluorspar: ³							
Acid grade, more than 97% calcium fluoride	102,000	423,000	72,300	87,200	83,200	126,000	368,000
Metallurgical grade, less than 97% calcium fluoride	27,200	78,800	8,100	13,700	1,680	4,430	27,900
Total	130,000	502,000	80,400	101,000	84,900	130,000	396,000

-- Zero.

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

²Source: U.S. Census Bureau; may be adjusted by U.S. Geological Survey.

³Defined as imports minus exports

⁴Less than ½ unit.

TABLE 2
U.S. IMPORTS FOR CONSUMPTION OF FLUORSPAR, BY COUNTRY AND VALUE^{1,2}

	2022									
	4th quarter		1st quarter–4th quarter							
	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)						
Acid grade, more than 97% calcium fluoride:										
Canada	--	--	12	\$6						
China	21,200	\$9,340	92,500	47,300						
Germany	64	50	65	53						
Hong Kong	--	--	276	160						
Japan	--	--	4,460	1,070						
Mexico	64,200	25,300	240,000	87,000						
South Africa	--	--	34,200	11,900						
Spain	--	--	43	42						
United Kingdom	21	12	57	51						
Vietnam	20,200	6,270 ^e	65,900	20,200 ^e						
Total	106,000	40,900 ^e	437,000	168,000 ^e						
Metallurgical grade, less than 97% calcium fluoride:										
Canada	--	--	8	5						
China	8,120	4,480	12,900	7,370						
Mexico	15,500	1,890	66,600	7,260						
Mongolia	--	--	249	147						
Pakistan	3,850	2,050	3,930	2,110						
South Africa	1,330	838	4,070	2,650						
United Kingdom	1	3	9	18						
Total	28,800	9,260	87,800	19,600						
Grand total	135,000	50,200 ^e	524,800	188,000 ^e						
	2023									
	1st quarter		2d quarter		3d quarter		4th quarter		1st quarter–4th quarter	
	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)
Acid grade, more than 97% calcium fluoride:										
Canada	2	\$7	145	\$77	--	--	--	--	147	\$84
China	--	--	11,600	5,170	14,600	\$6,480	--	--	26,200	11,600
Germany	73	42	74	43	--	--	143	\$84	290	169
India	--	--	--	--	2	9	--	--	2	9
Japan	26	17	--	--	235	122	--	--	261	139
Mexico	52,100	21,200	62,000	26,400	55,900	25,800	74,400	31,600	244,000	105,000

See footnotes at end of table.

TABLE 2—Continued
U.S. IMPORTS FOR CONSUMPTION OF FLUORSPAR, BY COUNTRY AND VALUE^{1,2}

	2023									
	1st quarter		2d quarter		3d quarter		4th quarter		1st quarter–4th quarter	
	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)	Quantity (metric tons)	Value ³ (thousands)
Acid grade, more than 97% calcium fluoride—Continued:										
Mongolia	--	--	145	77	--	--	--	--	145	77
South Africa	--	--	16,100	7,190	16,300	7,390	19,300	8,790	51,700	23,400
Spain	--	--	--	--	--	--	9,030	4,790	9,030	4,790
United Kingdom	--	--	1	4	--	--	2	9	3	13
Vietnam	23,600	7,330 ^e	--	--	--	--	26,000	8,210 ^e	49,600	15,500 ^e
Total	75,800	28,600 ^e	90,100	39,000	87,100	39,800	129,000	53,400 ^e	381,000	161,000 ^e
Metallurgical grade, less than 97% calcium fluoride:										
Canada	--	--	43	16	--	--	--	--	43	16
China	4,460	2,630	5,530	3,700	1,500	1,110	--	--	11,500	7,440
Mexico	4,010	521	9,040	995	1,780	287	6,100	778	20,900	2,580
Mongolia	--	--	--	--	--	--	68	45	68	45
South Africa	1,020	702	1,130	893	--	--	--	--	2,160	1,600
Total	9,490	3,860	15,700	5,610	3,280	1,390	6,170	823	34,700	11,700
Grand total	85,300	32,500 ^e	106,000	44,600	90,400	41,200	135,000	54,200 ^e	416,000	172,000 ^e

^eEstimated. -- Zero.

¹Imports for consumption include imports of immediate entry and warehouse withdrawals.

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

³Cost, insurance, and freight at U.S. ports.

Source: U.S. Census Bureau; may be adjusted by U.S. Geological Survey.

TABLE 3
U.S. IMPORTS FOR CONSUMPTION OF HYDROFLUORIC ACID^{1,2}

	2022				2023									
	4th quarter		1st quarter–4th quarter		1st quarter		2d quarter		3d quarter		4th quarter		1st quarter–4th quarter	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	--	--	--	--	(3)	\$19	(3)	\$15	(3)	\$12	1	\$27	1	\$73
Canada	19	\$60	329	\$693	135	232	37	406	155	264	147	242	475	1,140
China	535	715	757	1,080	236	327	430	535	614	706	311	402	1,590	1,970
Germany	265	898	628	1,790	371	1,060	145	443	53	178	268	890	838	2,570
India	--	--	98	271	--	--	40	66	97	190	170	278	307	533
Japan	422	1,210	2,060	4,820	517	1,520	363	1,130	418	1,090	635	1,450	1,930	5,190
Korea, Republic of	493	1,300	2,140	4,330	154	390	216	548	200	489	246	587	816	2,010
Mexico	13,700	34,000	87,900	177,000	26,500	54,900	21,400	57,300	16,300	43,200	10,300	25,900	74,400	181,000
Singapore	97	426	422	1,690	32	133	145	558	97	372	65	253	338	1,320
Spain	425	820	1,870	4,220	651	1,270	616	1,230	443	741	505	631	2,220	3,870
Sweden	--	--	--	--	--	--	--	--	21	6	--	--	21	6
Taiwan	423	1,250	2,830	8,850	868	2,530	520	1,310	422	1,200	913	2,630	2,720	7,670
United Kingdom	151	237	380	549	265	378	294	472	308	559	203	354	1,070	1,760
Total	16,500	40,900	99,400	205,000	29,700	62,700	24,200	64,100	19,200	49,000	13,700	33,700	86,800	209,000

-- Zero.

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

²Cost, insurance, and freight at U.S. ports.

³Less than ½ unit.

Source: U.S. Census Bureau.