

## FLUORSPAR

(Data in thousand metric tons unless otherwise noted)

**Domestic Production and Use:** There was little or no domestic mining of fluor spar in 2006. Some byproduct calcium fluoride was recovered from industrial waste streams, although data are not available on exact quantities. Material purchased from the National Defense Stockpile or imported was screened and dried for resale to customers. Domestically, about 85% of reported fluor spar consumption went into the production of hydrofluoric acid (HF) in Louisiana and Texas and aluminum fluoride in Texas. HF is the primary feedstock for the manufacture of virtually all organic and inorganic fluorine-bearing chemicals and is also a key ingredient in the processing of aluminum and uranium. The remaining 15% of the reported fluor spar consumption was as a flux in steelmaking, in iron and steel foundries, primary aluminum production, glass manufacture, enamels, welding rod coatings, cement production, and other uses or products. An estimated 40,000 tons of fluorosilicic acid (equivalent to about 70,000 tons of 92% fluor spar) was recovered from phosphoric acid plants processing phosphate rock. Fluorosilicic acid was used primarily in water fluoridation, either directly or after processing into sodium silicofluoride.

<b>Salient Statistics—United States:</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006<sup>e</sup></b>
Production:					
Finished, all grades	—	—	—	—	—
Fluor spar equivalent from phosphate rock	92	94	90	86	70
Imports for consumption:					
Acid grade	466	533	546	586	550
Metallurgical grade	28	34	53	43	54
Total fluor spar imports	494	567	599	629	604
Fluor spar equivalent from hydrofluoric acid plus cryolite	182	180	197	209	233
Exports <sup>1</sup>	24	31	21	36	15
Shipments from Government stockpile	23	75	62	28	78
Consumption:					
Apparent <sup>2</sup>	477	589	691	616	684
Reported	588	616	618	582	600
Price, average value, dollars per ton, c.i.f. U.S. port					
Acid grade	128	138	167	202	220
Metallurgical grade	89	85	83	93	100
Stocks, yearend, consumer and dealer <sup>3</sup>	245	206	105	131	88
Employment, mine and mill, number	—	—	—	—	—
Net import reliance <sup>4</sup> as a percentage of apparent consumption	100	100	100	100	100

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

**Import Sources (2002-05):** China, 63%; Mexico, 16%; South Africa, 16%; Mongolia, 4%; and other, 1%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12-31-06</b>
Acid grade (97% or more CaF <sub>2</sub> )	2529.22.0000	Free.
Metallurgical grade (less than 97% CaF <sub>2</sub> )	2529.21.0000	Free.

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

**Government Stockpile:** During fiscal year 2006, the Defense National Stockpile Center (DNSC) sold about 24,700 tons (27,200 short dry tons) of metallurgical-grade fluor spar and 4,420 tons (4,870 short dry tons) of acid-grade fluor spar from the National Defense Stockpile. Under the proposed fiscal year 2007 Annual Materials Plan, the DNSC will be authorized to sell 54,400 tons (60,000 short dry tons) of metallurgical grade and 10,900 tons (12,000 short dry tons) of acid grade, although actual quantities will be limited to remaining inventory.

<b>Material</b>	<b>Stockpile Status—9-30-06<sup>5</sup></b>			<b>Disposal plan FY 2006</b>	<b>Disposals FY 2006</b>
	<b>Uncommitted inventory</b>	<b>Committed inventory</b>	<b>Authorized for disposal</b>		
Acid grade	—	—	—	11	4
Metallurgical grade	8	18	8	54	25

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**Events, Trends, and Issues:** Hastie Mining Co. and Moodie Mineral Co. began a drilling program for fluor spar in Livingston County, KY, northeast of the former Klondike Fluorspar Mine. The partners are exploring a previously unmined vein deposit, and the preliminary results were described as quite promising. Hastie Mining, a supplier of acid-grade and metallurgical-grade fluor spar to assorted U.S. markets, has sourced the majority of its supply from National Defense Stockpile purchases since the mid-1990s. With the National Defense Stockpile almost exhausted and import sources uncertain, the company has decided to explore restarting fluor spar production from the Illinois-Kentucky Fluorspar Mining District. The company also has been stockpiling fluor spar ore produced as a byproduct at its limestone quarry in Hardin County, IL, and owns the mineral rights to several former fluor spar properties in Illinois. Hastie is installing a heavy media separation plant at the quarry and purchased an idle flotation plant at Salem, KY.<sup>6</sup>

Fluorspar prices remained high (especially for acid grade) and supplies were tight as China continued to restrict exports in order to supply its own growing fluorochemicals markets. Closures of fluor spar mines in France and Italy coupled with production difficulties in South Africa further exacerbated supply problems.

### **World Mine Production, Reserves, and Reserve Base:**

	Mine production		Reserves <sup>7, 8</sup>	Reserve base <sup>7, 8</sup>
	2005	2006 <sup>e</sup>		
United States	—	—	NA	6,000
China	2,700	2,750	21,000	110,000
France	90	40	10,000	14,000
Kenya	97	100	2,000	3,000
Mexico	873	950	32,000	40,000
Mongolia	368	370	12,000	16,000
Morocco	95	115	NA	NA
Namibia	<sup>9</sup> 116	<sup>9</sup> 127	3,000	5,000
Russia	210	210	Moderate	18,000
South Africa	265	240	41,000	80,000
Spain	140	150	6,000	8,000
Other countries	<u>306</u>	<u>300</u>	<u>110,000</u>	<u>180,000</u>
World total (rounded)	5,260	5,350	240,000	480,000

**World Resources:** Identified world fluor spar resources were approximately 500 million tons of contained fluor spar. The quantity of fluorine present in phosphate rock deposits is enormous. Current U.S. reserves of phosphate rock are estimated to be 1.0 billion tons, which at 3.5% fluorine would contain 35 million tons of fluorine, equivalent to about 72 million tons of fluor spar. World reserves of phosphate rock are estimated to be 18 billion tons, equivalent to 630 million tons of fluorine and 1.29 billion tons of fluor spar.

**Substitutes:** Olivine and/or dolomitic limestone have been used as substitutes for fluor spar. Byproduct fluorosilicic acid from phosphoric acid production has been used as a substitute in aluminum fluoride production, and also has the potential to be used as a substitute in HF production.

<sup>e</sup>Estimated. NA Not available. — Zero.

<sup>1</sup>Exports are all general imports reexported or National Defense Stockpile material exported.

<sup>2</sup>Excludes fluor spar equivalent of fluorosilicic acid, hydrofluoric acid, and cryolite.

<sup>3</sup>Industry stocks for three leading consumers, fluor spar distributors, and National Defense Stockpile material committed for sale pending shipment.

<sup>4</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>5</sup>[See Appendix B for definitions.](#)

<sup>6</sup>J. Watson, Jr., Plant Manager, Hastie Mining Co., oral commun., October 2006.

<sup>7</sup>[See Appendix C for definitions.](#)

<sup>8</sup>Measured as 100% calcium fluoride.

<sup>9</sup>Data are in wet tons.