

## FLUORSPAR

(Data in thousand metric tons unless otherwise noted)

**Domestic Production and Use:** In Illinois, fluor spar was processed and sold from stockpiles produced as a byproduct of limestone quarrying. Byproduct calcium fluoride was recovered from industrial waste streams, although data are not available on exact quantities. Domestically, about 85% of reported fluor spar consumption went into the production of hydrofluoric acid (HF) in Louisiana and Texas. 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. The remaining 15% of the reported fluor spar consumption was as a flux in steelmaking, in iron and steel casting, primary aluminum production, glass manufacture, enamels, welding rod coatings, cement production, and other uses or products. An estimated 55,000 tons of fluorosilicic acid (equivalent to about 97,000 tons of 92% fluor spar) was recovered from phosphoric acid plants processing phosphate rock. Fluorosilicic acid was used primarily in water fluoridation.

<b>Salient Statistics—United States:</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009<sup>e</sup></b>
Production:					
Finished, all grades	—	—	—	NA	NA
Fluor spar equivalent from phosphate rock	86	70	94	111	97
Imports for consumption:					
Acid grade	586	490	577	496	420
Metallurgical grade	43	62	43	76	40
Total fluor spar imports	629	553	620	572	460
Fluor spar equivalent from hydrofluoric acid plus cryolite	209	233	233	209	160
Exports	36	13	14	19	12
Shipments from Government stockpile	28	66	17	—	—
Consumption:					
Apparent <sup>1</sup>	616	608	613	528	460
Reported	582	523	539	506	410
Price, average value, dollars per ton, c.i.f. U.S. port					
Acid grade	202	217	NA	NA	NA
Metallurgical grade	93	101	111	107	110
Stocks, yearend, consumer and dealer <sup>2</sup>	131	90	90	115	100
Employment, mine and mill, number	—	—	—	—	—
Net import reliance <sup>3</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 recycle HF and fluorides from smelting operations. HF is recycled in the petroleum alkylation process.

**Import Sources (2005-08):** China, 52%; Mexico, 34%; South Africa, 9%; and other, 5%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12-31-09</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:** The last of the Government stocks of fluor spar officially were sold in fiscal year 2007.

**Events, Trends, and Issues:** In September 2009, after a year's delay, Hastie Mining Co. and Moodie Mineral Co. received the long-awaited final permit that allowed them to begin work on the Klondike II fluor spar mine in Livingston County, KY. Development of the mine was expected to take 12 to 18 months before production could begin.<sup>4</sup>

By the middle of 2009, effects of the worldwide recession had negatively affected several fluor spar producers in Africa, which is one of the leading fluor spar exporting regions. Three fluor spar mining companies in Kenya, Namibia, and South Africa were forced to curtail mining operations and mothball their facilities because of the plummeting demand for their products. In recent years, these three companies accounted for about 330,000 tons per year of fluor spar export sales.

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In June, the U.S. Trade Representative announced that the United States had requested World Trade Organization (WTO) dispute settlement consultations with China regarding China's export restraints on numerous important raw materials. The dispute concerned China's policy that provides substantial competitive advantages for the Chinese industries using these raw material inputs, including fluor spar. China is a leading global producer of fluor spar, which is an important mineral used in making numerous downstream products in the global aluminum, chemical, and steel industries. The European Union also requested formal WTO consultations with China on this matter.

Severely reduced demand for fluor spar resulted in a sharp decrease in Chinese acid-grade fluor spar prices of more than 30% compared with those of the fourth quarter of 2008. In September 2009, the published price (delivered to the United States) was in the range of \$350 to \$380 per metric ton.<sup>5</sup> Prices for low-arsenic acid-grade fluor spar from Mexico also decreased significantly. Prices for Mexican high-arsenic fluor spar were more stable owing to increased substitution for Chinese material. South African acid-grade prices stabilized because of better quality and reduced alternative supplies, as other African producers shut down.

As a result of accidental releases of HF at three U.S. petroleum refineries in Illinois, Pennsylvania, and Texas, the largest industrial union in North America called for the phaseout of HF used in petroleum alkylation units at refineries. The union planned to discuss alternatives to HF with the petroleum refining industry, and, if necessary, would work through the regulatory agencies and Congress to get the issue resolved. One-third of U.S. petroleum refineries use HF as an alkylation catalyst, while the other two-thirds use sulfuric acid, which is less dangerous because of its much lower vapor pressure. Petroleum alkylation accounts for about 15% of HF consumption in the United States.

**World Mine Production and Reserves:** Production estimates for individual countries were made using country or company specific data where available; other estimates were made based on general knowledge of end-use markets.

	Mine production		Reserves <sup>6,7</sup>
	2008	2009 <sup>e</sup>	
United States	NA	NA	NA
China	3,250	3,000	21,000
Kenya	98	45	2,000
Mexico	1,060	925	32,000
Mongolia	380	280	12,000
Morocco	61	40	NA
Namibia	<sup>8</sup> 109	60	3,000
Russia	269	210	NA
South Africa	316	180	41,000
Spain	149	110	6,000
Other countries	<u>350</u>	<u>250</u>	<u>110,000</u>
World total (rounded)	6,040	5,100	230,000

**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:** Aluminum smelting dross, borax, calcium chloride, iron oxides, manganese ore, silica sand, and titanium dioxide have been used as substitutes for fluor spar fluxes. Byproduct 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.

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

<sup>1</sup>Excludes fluor spar equivalent of fluorosilicic acid, hydrofluoric acid, and cryolite.

<sup>2</sup>Industry stocks for two leading consumers and fluor spar distributors.

<sup>3</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>4</sup>B. Moodie, Moodie Mineral Co., oral commun., August 31, 2009.

<sup>5</sup>Industrial Minerals, 2009, Prices: Industrial Minerals, no. 505, October, p. 84.

<sup>6</sup>See Appendix C for definitions. Reserve base estimates were discontinued in 2009; see [Introduction](#).

<sup>7</sup>Measured as 100% calcium fluoride.

<sup>8</sup>In previous years, data were in wet tons, but this quantity has been converted to dry tons to agree with other country data.