

FLUORSPAR

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World fluorspar production in 2002 is estimated at 4.2 Mt – essentially unchanged from 2000 and 2001. Output of acid-grade fluorspar (acidspar) was 2.71 Mt (2.76 Mt) and destined mainly for the fluorochemical and aluminium industries; metallurgical-grade fluorspar (metspar) output was 1.5 Mt (1.5 Mt) and the predominant use was the steel and cement industry. World fluorspar production reached a record high of 5.48 Mt in 1989, ahead of the impact from the Montreal Protocol on CFCs; the low-point in production, of 3.74 Mt, was reached in 1994 following the subsequent phase-out of CFC manufacture.

The market last year continued to be dominated by China with an output estimated at 2.15 Mt (51% of the world total) of which 1.01 Mt was reportedly exported. The other major producers with outputs in excess of 100,000 t and accounting for a further 36% of the total were: Mexico (650,000 t – 15.5%), South Africa (227,000 t – 5.4%), Mongolia (4.8%), Russia (4.5%), Spain (3.1%) and France (2.5%).

Supply and demand continued reasonably balanced (see Table 1) but there was some evidence of stocks rising as a result of global recessionary trends on general GDP use of fluorspar. The principle consumers taking over 80% of world output remained China (1.15 Mt), Western Europe (900,000 t), the US and Canada (600,000 t), Japan (400,000 t) and the CIS (350,000 t).

Acidspar prices softened during the year as reflected by the decrease in both the average import price cif US (US\$127/t against US\$136/t in 2001) and the spot price ranges for filtercake cif port quoted by *Industrial Minerals* magazine. This was in part due to a build-up of stocks as a result of lower consumption levels, particularly in Japan, Europe and the US. There has, however, been a very strong upward price move in the first half of 2003 following the announcement in late 2002 of a reduction in the Chinese export quota for 2003 to 850,000 t. (1.0 Mt in 2002); *Industrial Minerals'* spot-market quotations initially rose to US\$130-138/t, in March 2003 had reached US\$141-150/t cif US gulf port and by July quoted at US\$152-156/t (Table 2).

There were no reports of new mine operations commencing in the year but two proposed ventures have been reported in the technical press. Mineral Securities Ltd (MSL) of Perth, Western Australia, announced plans to open its 150,000 t/y Speewah mine in the east Kimberley region of WA and 110 km south-west of Kununurra, with a view to start operations at the end of 2004. Tiberon Minerals Ltd from Alberta, Canada, completed a pre-feasibility study for its Nui Phao tungsten-fluorite orebody in Vietnam, 80 km north of Hanoi. This open-pit mining operation could potentially produce 200,000 t/y of by-product acidspar, albeit from a very low 8-11% CaF₂ head feed. The operation, with two local partners, would produce tungsten oxide as the main

product as well as copper, gold and bismuth. Tiberon is looking for a start-up date in early 2006.

Meanwhile, residual use of fluorspar from previously sold US stockpile material provided some 100,000 t/y input to the market and a further two to three years of supply from this source remains.

In the downstream market, the purchase by Solvay SA of the Italian fluorine specialty producer Ausimont SpA concluded and the merged fluoropolymers business was re-launched as Solvay Solexis in January 2003, with production sites in Brazil, France, Italy, Japan and the US. Following the phase-out of the foam-blowing agent HCFC 141b in the US and Europe from January 1, 2003, several new fluorine derivative plants to replace HFCs were installed. These include: Solvay's 365mcf plant in Tavaux, France in January 2003; Honeywell's 245fa plant in Geismar, Louisiana in August 2002; and Atofina's HCFC32 plants in Zaramillo, Spain and Calvert City, US. There is indication that hydrofluoric acid production capacity in Europe and the US is not matching the increased demand for the new products and a tight supply for HF is foreseen.

There was HF capacity expansion in China, particularly in Fujian Province, with some reports suggesting a capacity approaching 300,000 t/y. Atofina started a fluorocarbon plant in China; and in mid-2003 Dupont has announced a joint venture HFC operation to commence production in the first half of 2004 in Jiangsu Province. Growth in fluoropolymers continued in the range 3-6% worldwide and current world demand is some 114,000 t/y.

Pechiney continued to pursue its new 460,000 t/y US\$2.15 billion aluminium smelter near Port Elizabeth, South Africa, using its latest AP50 technology, and expects to start operations in the first half of 2005. There were reports of a new aluminium fluoride plant in Dubai which would require 45,000 t/y of acidspar.

Anti-dumping measures against Chinese acidspar continue in Europe, Mexico and Russia. The EU opened a review of the minimum price mechanism for various minerals including acidspar in July and the results are still awaited.

North America

Mexico remained the only fluorspar producer in the region. Output increased to 650,000 t (619,500 t) with a significantly increased production of acidspar at 390,000 t (343,500 t) from all producers in the country. Some 70% of the output was from Las Cuevas, with a significant acidspar output also from Fluorita de Mexico, and smaller quantities from Minera Muzquiz in Coahuila and Minerales y Productos Metalurgicos (MPM) in Durango.

Much of the acidspar was converted domestically to hydrofluoric acid and aluminium fluoride. Exports of metspar and acidspar included 68,400 t (65,400 t) to Canada, 58,100 t (54,200 t) to the US, 25,900 t to Italy (31,400 t) and a much reduced 23,100 t reported import (110,500 t) to Japan. There was also significant export of mainly metspar to Europe, South America and Asia;

and an increasing tonnage for use in cement clinker manufacture both domestically and in South America.

US imports were lower at 494,500 t (522,000 t) of which 466,000 t (495,000 t) was acidspar for the hydrofluoric acid and aluminium industry. There were reports of a continuing growth in HF consumption of around 1% a year and this is predicted to continue.

Although there have been no fluorspar sales from the National Defense Stockpile since 2000, re-processing of previously sold materials continues to feed the market – around 70,000-80,000 t in 2002. There was at year-end a further reported 100,000 t (130,000 t) of acidspar and 23,000 t (51,000 t) of metspar “sold pending shipment”, plus some 97,000 t (112,000 t) of unsold material overhanging the market.

Of this, about 7,000 t (9,000 t) was acidspar, sufficient, perhaps, for a further two to three years of supply at the 2002 use rate! Some synthetic fluorspar continued to supplement domestic consumption of the order of 5,000t–10,000t/y. There were US stockpile exports of 24,300 t (16,400 t) mainly to Canada but some 5,000 t went to Taiwan.

Canadian demand for fluorspar continued to be met entirely by imports. In 2002, these decreased to 153,700 t (164,200 t) of which 132,200 t was acidspar (149,400 t). Imports came principally from Mexico (45%), Morocco (26%) and from the US stockpile (21%), with a further 8% from China. There were no further published reports on the plans by Burin Minerals to reopen the Newfoundland mine and mill.

South America

The only reported output from the region was 43,800 t (43,700 t) from Brazil and 7,700 t (9,100 t) from Argentina. All South American production was consumed domestically, supplemented by imports, mainly from Mexico and also from Europe estimated at around 100,000 t.

Western Europe

Production remained unchanged at 380,000 t (381,000 t), with output by individual producers remaining essentially the same.

Most production was consumed within Europe apart from 24,100 t (14,800 t) of the continuing shipments from France to the Tunisian aluminium industry, and smaller quantities of acidspar for speciality applications to all continents.

Imports continued to supplement the estimated 900,000 t consumption requirement, with a reduced 252,500 t (296,000 t) from China, an estimated increase to 271,000 t (209,000 t) from Africa, and a significant tonnage from Mexico. German imports were particularly strong at 272,900 t (266,700 t). There was a significant but reduced import volume to Italy, at 162,500 t (209,600 t). The other main importer continued to be Norway with an estimated requirement of some 45,000t for the Noralf aluminium fluoride operation.

CIS and Mongolia

Output appears to have increased slightly to 390,000 t (375,000 t). Some 97% of this production is attributed to the Yaroslavsky Mining Complex near Vladivostok in Russia, and to the Mongolian-Russian joint enterprise Mongolrostsvetmet in Bor-Undur, Mongolia. JSC Yaroslavsky GOK is now the only Russian producer. Testing of its new briquette plant was reported in mid-2002, with an anticipated eventual capacity of 100,000 t/y. The only other CIS production to be reported was in Tajikstan and Kyrgyzstan. Production is entirely for domestic consumption and the region is essentially self-sufficient.

Asia and Australasia

Total production again fell slightly, to 2.25 Mt (2.27 Mt). Output was almost entirely from China, with the Democratic Republic of Korea and Hadavi Corp. in Iran, together contributing some 74,000 t (70,000 t). Small quantities were reported from Thailand and Pakistan although there is indication of higher production from Thailand, as reflected in a 7,000 t shipment of metspar to Japan.

Of the assessed Chinese total production of 2.15 Mt (2.2 Mt), published exports were reported down again at 1.01 Mt (1.11 Mt in 2001 and 1.2 Mt in 1999 and 2000). Domestic consumption is estimated at 1.14 Mt (1.09 Mt) comprising – 440,000 t of acidspar, 300,000 t of metspar and 400,000 t as sub-metallurgical grade for the construction industry. This reflects an annual increase of 5-10% in acidspar use in the past three years. Current installed HF (hydrofluoric acid) capacity is in excess of 240,000 t/y and could be as high as 300,000 t/y (requiring some 660,000 t/y of acidspar). China has also been developing a small but growing export market in HF during the past five to seven years. In the first half of 2002 this totalled 5,350 t, mainly to Japan, South Korea and Taiwan (compared with 7,600 t in the whole of 2001) There is now also evidence of the export of added-value fluorochemicals manufactured in China and surplus to the domestic market.

Further rapid domestic production growth in China is considered potentially restricted by the limitations of current mining operations and an increase in the manufacture of inorganic fluorides using waste fluosilicic acid.

The licence fee for exports from China remained similar to 2001 at around US\$53/t for the official 1.0 Mt quota. In November, a further reduction in the quota for 2003 down to 850,000t was announced. This resulted in a sharp increase in quoted spot prices in *Industrial Minerals* to the range US\$128-135/t cif US gulf port, and further increases from March to US\$141-150/t and in July to \$152-156/t. The first tranche of licences awarded for 2003 were for 700,000 t at an average price around US\$63/t - some US\$10/t higher than in 2001 and 2002 (275,000 t agreement bid at Yu320/t and 425,000 t open bidding at Yu650/t).

Information on individual operations in China is sparse and often conflicting. Production is dominated by Zhejiang Province (around 50%), with significant output from Fujian and Jiangxi. In recent years closures and consolidations

have seen the number of flotation mills reduce from some 125 in 1997 to nearer 78 in 2002. Half of these operations have only come on stream since 1997. Some 10% of the total remain state-owned, compared with 100% in 1990. Environmental issues and the conditions to be met in the transition to WTO membership are increasing domestic production costs, with particularly adverse impact on the smaller mines.

Export destinations and reported tonnages were primarily Japan, 297,200 t (401,000 t), the US, 344,000 t (353,000 t), Western Europe 252,500 t (296,000 t) and elsewhere in Asia 67,600 t (80,000 t), with smaller shipments to Canada, Tunisia and Australia.

Japan's reported imports fell sharply to 397,000 t (515,200 t) of which 238,800 t were acidspar (301,300 t). Of the total, 90% (79%) came from China (97% of the acidspar and 80% of the metspar). Kenya supplied some acidspar, and Mexico and Thailand the remaining metspar.

Africa

Total production showed a sharp decrease to 494,500 t from 564,400 t in 2001. This was primarily a result of production problems at the recently re-opened Buffalo retreatment operation in South Africa, and there were also reports of ownership disputes. There were also production problems at Witkop with a change in ore feed although, following a flotation-plant upgrade between December and February 2003, there were reports of production levels returning to normal from March. Producers were also plagued by rail transport problems – lack of availability of rolling stock and long transit periods.

South Africa continued as the dominant player, with an output of 227,000 t (286,400 t) followed by Kenya with output around 100,000 t, and Morocco and Namibia each with 80,000 – 90,000 t. A very small metspar output was reported from Egypt. Solvay's Okorusu mine in Namibia continued to increase its output and all production was exported to the parent fluorochemical business in Germany.

Apart from servicing a small level of domestic sales in South Africa (officially reported at 45,600 t (54,700 t), all African fluorspar output was exported to world markets. South African exports were primarily to the US (49%) and Europe; Moroccan exports to Canada (45%), Norway, Italy and Tunisia; Namibian exports to Germany (100%); and Kenyan exports to Europe (50%). The 30,000 t/y aluminium fluoride operation in Tunisia continued to import all its requirements from France, China and Morocco.

Outlook

There are indications that the fluorspar market has stabilised, most particularly for acidspar, and has reasonably survived the worldwide recessionary period and the 2003 phase-out of HCFCs. Although consumption has fallen, particularly in the Western world, and stocks have risen, fluorspar prices are now generally hardening, giving some encouragement and optimism to producers. The Chinese have continued to

set more realistic export quotas and licence fees, and are consuming more domestically.

World consumption of fluorspar has stabilised but this masks the steady increase in acidspar use, offset by continued reduction in the use of metspar for steelmaking owing to technical innovations and more efficient furnaces in both Western countries and the developing countries. The small use of metspar in the ceramic and fibreglass industry remains steady and there is growth in its use in the cement industry, with a reported future potential 200,000 t/y market in North America, and also indications for greater use in South Africa

Consumption of fluorspar should benefit from the continuing overall worldwide growth in the aluminium industry (although this has not happened in the US in recent years) and in the refrigerants, blowing agents and general fluorochemicals business. Whilst the HCFC market will shrink dramatically due to phase-outs (eg, 25% of European refrigerators are now using hydrocarbons), there is a 10-15% world annual growth in HFC demand and there is commensurate confidence and investment. The installed capacity for HF in Europe is tight to feed the new industry and price levels could rise. The fluoropolymer industry continues to boom and worldwide growth rates of 3-6% are seen through to 2010.

The potential threat from Kvaerner's new fluosilicic acid conversion (FSA) process has not developed and is generally considered unlikely in the medium term not least on production cost grounds.

Acidspar output is running at around 80% of installed capacity. Any future supply shortfall in the market of 100,000 – 200,000 t could continue to be met by increased output from current operations.

However, growing environmental and safety pressures in China, and elsewhere in the developing world, may in due course affect supply patterns and there is already evidence of reduced Chinese output. This could be offset from either or both of the reported new operations (in Australia and Vietnam) which might possibly be contributing up to 350,000 t/y of acidspar to the market by 2005-06.

Overall, 2003 looks set to maintain a similar volume of consumption to 2002 but better prices owing to the supply shortfalls from China. The growth in fluoropolymers and aluminium smelting should continue and offset any further effects of economic recession on GDP. Modest demand growth should hopefully return in late-2004.

Table 1: Fluorspar Supply and Demand ('000 t)

	Production		Consumption	
	2001 ^r	2002 ^p	2001	2002
Asia – China	2,200	2,150	1,100	1,150
- Other	70 ^r	74	650	550
N America & Mexico	620 ^r	650	950	900
S America	53 ^r	52	100	150
Western Europe	381	380	1,000	950
CIS and Mongolia	374 ^r	402	350	300
Africa	564 ^r	494	100	100
Total	4,262	4,202	4,250	4,100

^r revised ^p provisional

Table 2: Fluorspar Prices (US\$/t)

	2000	2001	2002
US imports - acid grade	128	136	127
cif – metspar	84	82	92

Industrial Minerals'
quotation

Chinese acidspar	130-135	136-141	128-135	141-150
filtercake cif US gulf port,				Mar 2003
December				152-156
				Jul 2003