Note: Key data/information in these pages is hidden, while in the report is not.

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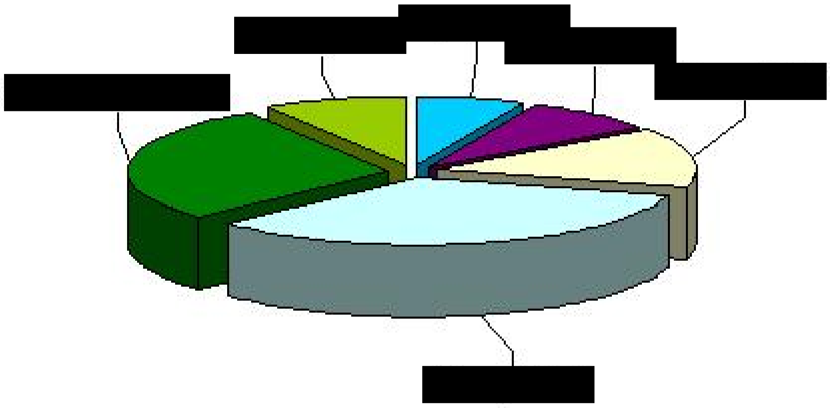
4.1 Overview of fluorite reserves in China

In 2011, the total domestic proven reserves of fluorite is about XXX million tonnes. Two large fluorite mines are found in Inner Mongolia Province, with about XXX million tonnes of proven reserves of fluorite.

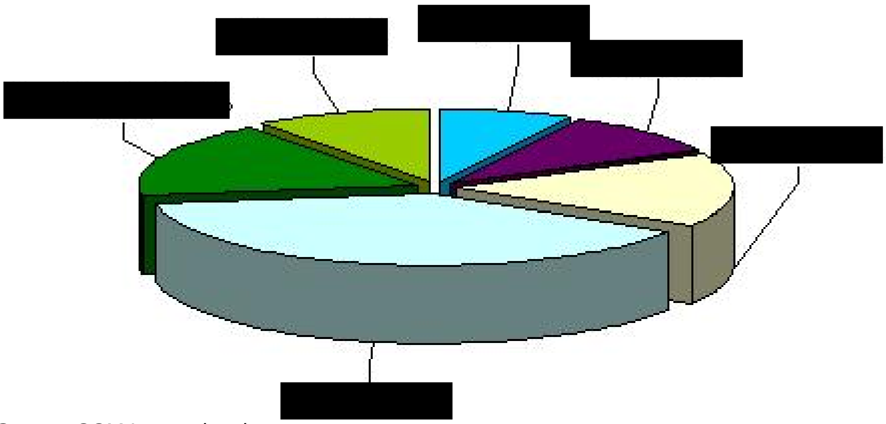
By the end of 2010, China had been the largest holder of proven reserve of fluorite in the world, with about XXX million tonnes of proven reserves of fluorite, which accounted for XXX% of the world's total. But compared with the proven reserves, technical reserves of fluorite in China were about XXX million tonnes, only accounting for no more than XXX% of the world's total. China owns the third largest technical reserves of fluorite in the world, following South Africa and Mexico, whose technical reserves were about XXX million tonnes and XXX million tonnes respectively in 2010.

Figure 4.1-1 Fluorite proven reserve distribution in China, 2011



Source: CCM International

Figure 4.1-2 Fluorite proven reserves distribution in China, 2010



Source: CCM International

China's fluorite reserves are concentrated in Hunan Province, Inner Mongolia Province, Zhejiang Province, Jiangxi Province and Fujian Province. These five provinces account for XXX% of China's total in 2011.

Fluorite proven reserve distribution has changed in 2011 since two large fluorite mines are found in Inner Mongolia Province. The proven reserves of fluorite in Inner Mongolia increase to XXX million tonnes from XXX million tonnes in 2010, which accounts for XXX% of the total domestic proven reserves of fluorite in 2011, increasing by XX% compared with that in 2010.

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5.1 Hydrogen fluoride

Hydrogen fluoride, the basic fluorine chemical product, is mainly used to produce refrigerants, fluor resin, fluor rubber, intermediates and fine chemicals, etc. Besides, hydrogen fluoride takes up the biggest output among all kinds of inorganic fluoride products.
China is the biggest producer of hydrogen fluoride in the world and the total capacity of hydrogen fluoride is about XXXt/a in 2011.

There are more than XXX hydrogen fluoride manufacturers in China, and more than 10 producers' hydrogen fluoride capacity is over 50,000 tonnes. The top three producers in China are Dongyue Group Ltd. (Dongyue Group), Centralfluor Industries Group, Inc (CFIC) and Yingpeng Group (Yingpeng Group), with capacity of XXXt/a, XXXt/a and XXXt/a respectively in 2011.

Besides, most producers concentrate in Zhejiang Province, Fujian Province, Jiangxi Province, where there are not only rich fluorite resources but also many downstream enterprises of hydrogen fluoride.

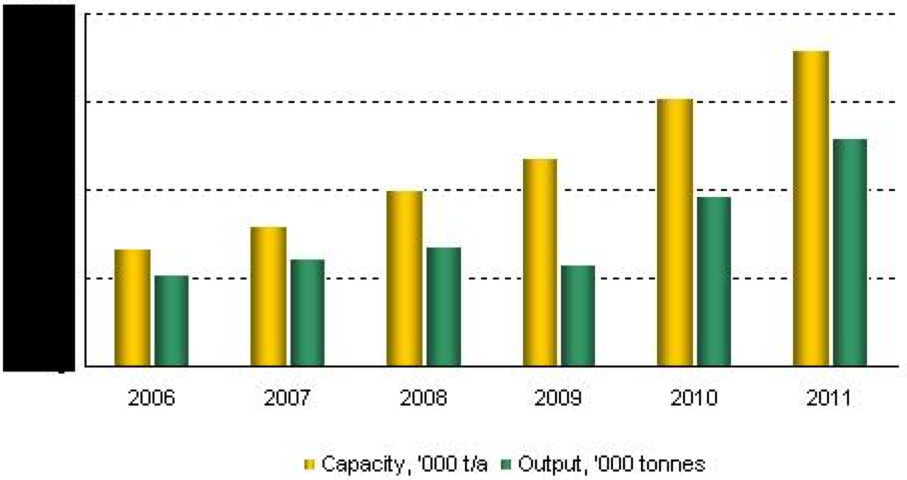
Table 5.1-1 Main producers of hydrogen fluoride in China, 2011

No.	Name	Abbreviation	Capacity, t/a
1	Dongyue Group Ltd.	Dongyue Group	XXX
2	Centralfluor Industries Group, Inc	CFIC	XXX
3	Yingpeng Group	Yingpeng Group	XXX
4	XXX	XXX	XXX
5	XXX	XXX	100,000
6	XXX	XXX	XXX
7	XXX	XXX	XXX
8	Inner Mongolia Dongyue Peak Fluorine Chemicals Co., Ltd.	Inner Mongolia Peak Fluorine	XXX
9	XXX	XXX	52,000
10	Hebei Pingquan Greatwall Chemical Co., Ltd.	Heibei Greatwall	XXX
11	Gansu Baiyin Zhongtian Chemical Co., Ltd.	Gansu Zhongtian	XXX

Note: The main producers are the top11 hydrogen fluoride producers in tel interview by CCM International

Source: CCM International

Figure 5.1-1 Capacity and output of hydrogen fluoride in China, 2006-2011



Source: CCM International

Domestic hydrogen fluoride developed rapidly with capacity CAGR of XXX% from 2006 to 2011 and the capacity of hydrogen fluoride has reached XXXt/a in 2011 from XXXt/a in 2006. Due to Chinese government issued some policies to restrict the export of fluorite in recent years, more and more foreign enterprises who used to imported fluorite from China have transferred to purchase hydrogen fluoride, which enlarges the demand for domestic hydrogen fluoride to some degree. Besides, domestic demand for hydrogen fluoride increased fast also due to the fast development of domestic fluoride chemical industries. Owing to the increasing demand for hydrogen fluoride, the whole hydrogen fluoride industry has developed rapidly in recent years.

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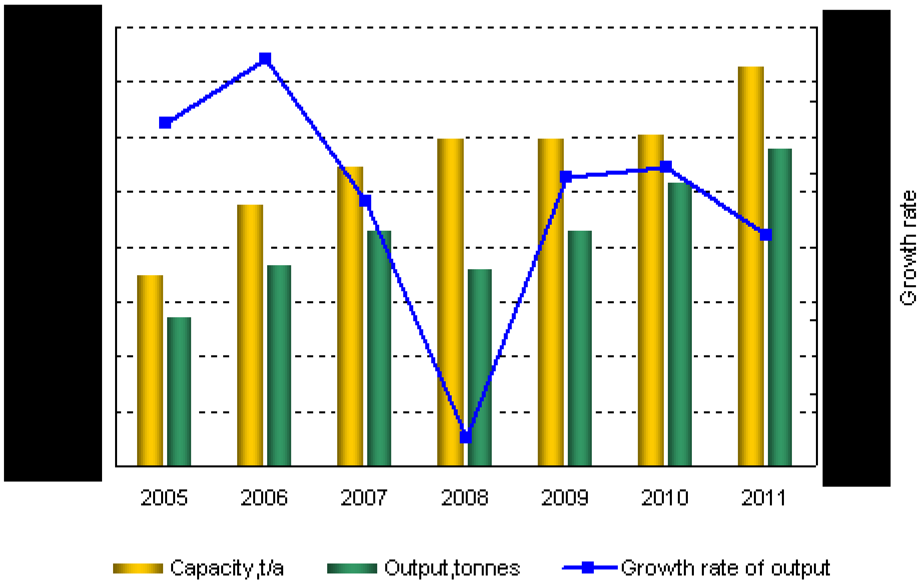
6.2.1 Situation of HCFC-22

- Production

Currently, HCFC-22 is the major fluor-refrigerant in China, accounting for about XX% of the total fluor-refrigerant consumption volume. Domestic capacity and output of HCFC-22 are about XXXt/a and about XX tonnes in 2011, increasing by XXX% and XXX% respectively than those in 2010. Dongyue Group Ltd.(Dongyue Group) and Jiangsu Meilan Chemical Group Co., Ltd.(Jiangsu Meilan) expand their capacity of HCFC-22 with XXXt/a and XXXt/a in 2011. Their total expansion capacity account for about XXX% of the total new capacity in China in 2011.

Domestic capacity and output of HCFC-22 has kept a stable increasing trend from 2005 to 2011, with CAGR about XXX% and XXX% respectively. Nevertheless, influenced by global financial crisis of 2008, the output of HCFC-22 was XXX% lower in 2008 than a year earlier. Following China economic revival since 2009, domestic demand of HCFC-22 has been increasing, which directly push the output increase year by year. In addition, the capacity of HCFC-22 was stagnant during 2008 to 2010 because China has restricted the capacity expansion of HCFC-22 as refrigerant. However, the capacity of HCFC-22 increases rapidly in 2011 because China permits the capacity expansion of HCFC-22 as raw material of PTFE to supply for the increasing global market of PTFE.

Figure 6.2.1-1 capacity and output of HCFC-22 and output growth rate in China, 2005-2011



Source: CCM International

According to the Montreal Protocol, China will stop the capacity expansion of HCFC-22 as refrigerant before 2013. However, the ban doesn't involve other uses of HCFC-22, including raw material of PTFE and as well as raw material of new environmental protection refrigerants. Neimenggu Yonghe Fluorochemical Co., Ltd. plans to establish a production line of HCFC-22 with a capacity of XXXt/a in April 2012, all the HCFC-22 would be supplied to fluororesin manufacture.

On one hand, though the global demand of HCFC-22 refrigerant is decreasing, the demand of HCFC-22 as materials is increasing. On the other hand, the production of HCFC-22 in developed countries has been stopped but the global demand for HCFC-22 is still large. It means the overseas demand for HCFC-22 in China would be strong in the near future.

Therefore, it is predicted that domestic capacity of HCFC-22 will keep steady in the next five years but the output of HCFC-22 will keep increasing.

There are about 20 producers of HCFC-22 in China and most of them are concentrated in East China. More than XXX% capacity of HCFC-22 is concentrated in Zhejiang Province, followed by Shangdong Province and Jiangsu Province.

Domestic capacity and output of HCFC-22 are mainly concentrated in three large producers which are Dongyue Group, Juhua Group and Jiangsu Meilan. Their capacity and output account for about XXX% and XXX% of the total manufacturers of HCFC-22 in China. Besides, Dongyue Group who has complete fluorine industrial chain is the largest producer of HCFC-22 with capacity and output of XXXt/a and XXX tonnes in 2011. Dongyue Group is able to produce hydrogen fluoride and chloroform as raw materials of HCFC-22 to satisfy itself, and part of its HCFC-22 as raw material of PTFE.

Table 6.2.1-1 Major producers of HCFC-22 in China, 2011

No.	Name	Abbreviation	Location	Capacity, t/a	Output , tonne
1	Dongyue Group Ltd.	Dongyue Group	Sandong	XXX	XXX
2	Juhua Group Corporation	Juhua Group	Zhejiang	XXX	XXX
3	Jiangsu Meilan Chemical Group Co., Ltd.	Jiangsu Meilan	Zhejiang	XXX	XXX
4	XXX	XXX	Jiangsu	XXX	XXX
5	XXX	XXX	Zhejiang	XXX	XXX
6	XXX	XXX	Jiangsu	XXX	XXX
7	XXX	XXX	Sichuan	30,000	19,000
8	XXX	XXX	Zhejiang	30,000	20,000
9	Linhai Limin Chemicals Co.,Ltd.	Linhai Limin	Zhejiang	XXX	XXX
10	Zhejiang Yonghe New Type Refrigerant Co., Ltd.	Zhejiang Yonghe	Zhejiang	XXX	XXX
11	Others	/	/	XXX	XXX
	Total			**XXX**	**XXX**

Source: CCM International

- Consumption

HCFC-22 is the most widely used low-temperature refrigerant in China, mainly used in home air conditioning, central air conditioning, refrigerator, cold storage, etc. It is also used as raw material in producing PTFE as well as HFC-125. The total consumption of HCFC-22 is XXX tonnes in 2011.

In 2011, the consumption volume of HCFC-22 directly used in new air conditioning accounts for XXX% of the total consumption of HCFC-22.

Nowadays, China is the largest producer and consumer of air conditioning in the world. About XX% of global air conditioning is manufactured in China. The output of China air conditioning is 139,125,000 units in 2011 in China. Besides, about 60% air conditioning uses HCFC-22 as refrigerant while others which is exported to developed countries uses HFC-410A as refrigerant.

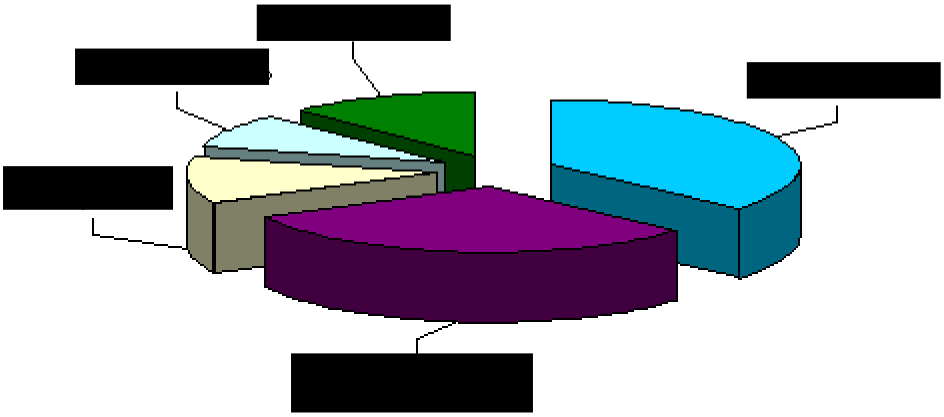
HCFC-22 is also the raw material of HFC-125 while HFC-410a is mixed by 50% HFC-125 and 50% HFC-32. About XXX tonnes of HCFC-22 are used for manufacturing HFC-410A, making up of XXX% in the domestic total HCFC-22 consumption in 2011.

PTFE shares about XXX% of domestic total HCFC-22 consumption in 2011 in China. Others and foam beater share about XXX% and XXX% respectively. Besides, others include air conditioning maintenance and cold storage.

Actually, in 2011, about XXX% of total consumption volume of HCFC-22 is consumed as refrigerant, including new air conditioning with HCFC-22, new air conditioning with HFC-410a, cold storage with HCFC-22, air conditioning maintain.

With HCFC-22 refrigerant elimination process, it is predicted that more consumption volume of HCFC-22 as refrigerant would transfer to PTFE in the further.

Figure 6.2.1-2 Consumption pattern of HCFC-22 in China, 2011



Note: New air conditioning in this chart refers to the new air conditioning with HCFC-22.

Source: CCM International

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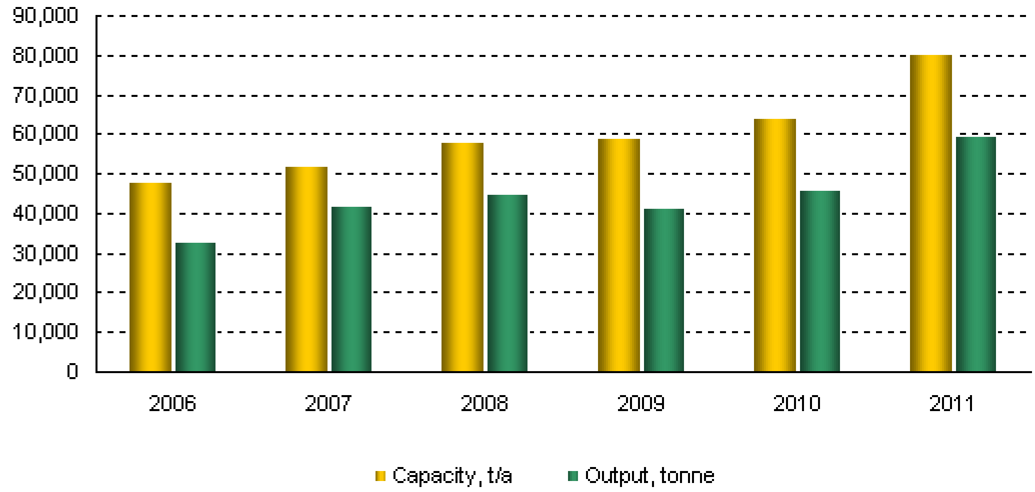
7.1.2 Production and market situation of major products

1) PTFE

-Production

The capacity of PTFE increases from XXX tonnes in 2006 to 80,250 tonnes in 2011, with CAGR of XXX%, and the output of PTFE is XXX tonnes in 2011. The operating rate of PTFE was XXX% in 2010 and is XXX% in 2011, reflecting that the production of China's PTFE is in overcapacity to a certain extent.

Figure 7.1.2-1 Production status of PTFE in China, 2006–2011



Source: CCM International

According to the investigation of CCM International, Dongyue Group Ltd. (Dongyue Group) is the biggest PTFE producer with a capacity of XXXt/a, and its capacity share accounts for about XXX% in China in 2011.

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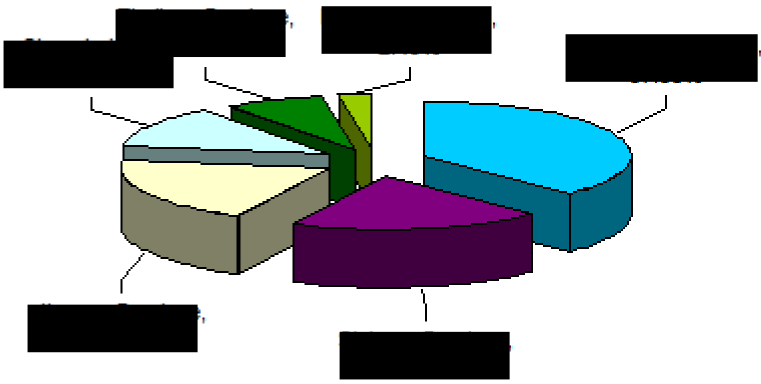
China's production of PTFE concentrates in Shandong Province, Sichuan Province and Jiangsu Province. Production of PTFE in these three areas accounts for over XXX% of the total capacity in China in 2011.

There are at least three manufacturers in the Jiangsu High-Tech Fluorine Chemical Industrial Park—Dakin (China) Industry Ltd.(Dakin China), DuPont (Changshu) Fluorinated Chemical Technology Co., Ltd. (DuPont Changshu) and Changshu 3F Fluorochemical Industry Co., Ltd.(Changshu 3F). In addition, some of the producers have formed an integrated industry chain. For example, Changshu 3F offers DuPont Changshu TFE to produce PTFE, while DuPont Changshu sells PTFE to Solvay Specialty Polymers (Changshu) Co., Ltd.(Solvay Changshu) for Solvay Changshu's superfine PTFE production.

Figure 7.1.2-2 Geographical distribution of PTFE production in China by capacity, 2011



Source: CCM International

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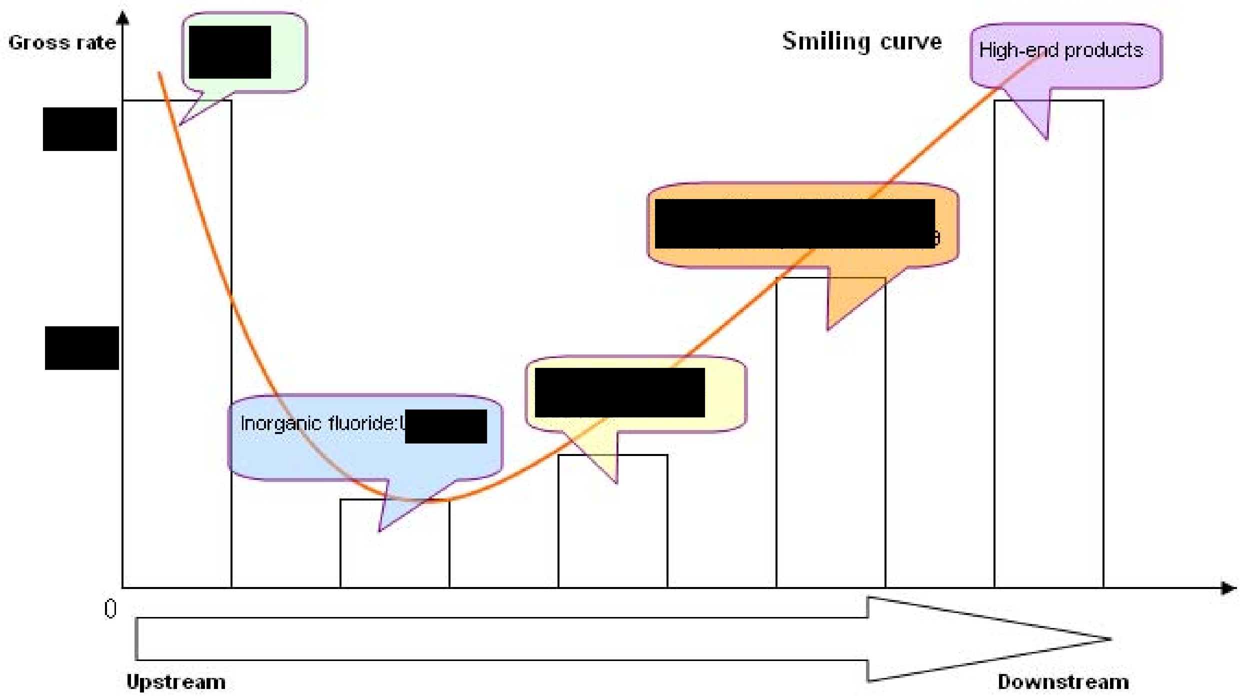
9.3 Fluorine industry chain analysis

China has formed a perfect fluorine industry chain, from raw materials to end-use products, covering each segment. Low-end products, such as hydrogen fluoride, HCFC-22, primary fluor-resin and fluorobenzene, are largely produced in China. Besides, some high-end products, such as electronic grade hydrogen fluoride, inorganic fluorides used in lithium battery and fluor-intermediates used in TFT-LCD, are already produced in China.

CCM International has investigated the whole fluorine industry chain in China and found a smiling curve in it, by analyzing the gross profit in each segment.

Figure 9.3-1 Gross profit analysis in fluorine industry in China, 2011



Note: Data here is for the products' output value, B for billion.

Output value of fluor-refrigerant is for HCFC-22, HFC-134a and HFC-410A.

Output value of inorganic fluoride is for hydrogen fluoride, aluminum fluoride and cryolite.

Source: CCM International

The total output value of fluorite, inorganic fluoride and fluor-intermediate has reached XXX billion in China, accounting for about XXX% of the total output value. Thus, it is obvious that primary product production is still the dominant part in China's fluorine industry.

The gross profit of fluorite companies in 2011 is much higher than before, thanks to the fast increasing price of fluorite in China. With the advancement of fluorite resources integration, the price of fluorite will not fall back to the level of lower than XXX/t again. So CCM International …