

China Fluoride Materials Monthly Report

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Headline

Last year, 2016, a succession of policies relating to the fluorochemical business were released. CCM has specifically selected 4 key policies for analysis, resource tax reform for the fluorite segment, the substitution of fluorine-enriched refrigerants, anti-dumping, and industry development plan.

At the end of 2016, China's HCFC-22 price stopped falling and made a rebound, impacted by the deficient production quota and the active stock-up by downstream enterprises. CCM believes that the price will fall again during Jan.-Feb. 2017.

In Jan. 2017, Suzhou Fluolyte released a proposal for private placement, a move intended to raise funding for its main business development.

In Jan. 2017, Shanghai 3F expected a loss in full-year 2016. This loss continued for 2 consecutive years, indicating that its shares will be highlighted for delisting risk following the official release of its 2016 financial report.

In Jan. 2017, Do-Fluoride announced that one of its subsidiaries AEVs had been listed in the latest government recommended automobile catalogue. CCM believes that this year, 2017, will be the first year in which Do-Fluoride accelerates AEV business development and turns a profit, given that a proposal to adjust subsidies offered has already been issued.

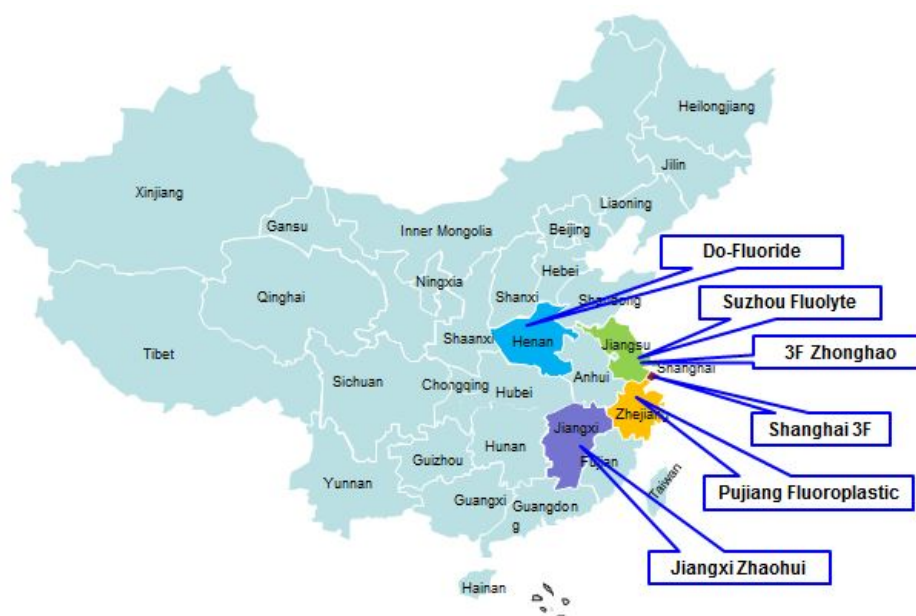
In Jan. 2017, the MEP unveiled the HCFCs production / use quotas in 2017. Specifically, the production quotas are equal to that in 2016.

In late Dec. 2016, China officially released the environmental protection tax law, which is to be implemented on 1 Jan. 2018. The new law replaces the existing pollutant discharge fee system with an environmental protection tax system, some of the revenue from which will go to local government, and brings with it greater enforcement of the law.

In Jan. 2017, Jiangsu Zhongtian passed the scientific achievement appraisal for its independently developed PVDF membrane for PV back-plate. Thanks to its high quality and low cost, the membrane is expected to be supported by government policies which are now targeted at reducing costs for PV modules, during the promotion of mass application.

In Dec. 2016, impacted by environmental policies and decreased supply, the quoted price of AHF in southern China rose significantly, followed by northern China.

In Dec. 2016, China's PTFE price rose significantly, impacted by the decreased supply and the increased raw material price.





Editor's Note

In Jan. 2017, China's fluorochemical manufacturers maintained low operating rates, causing tight supplies and increasing prices. For instance, the prices of fluorite ($\text{CaF}_2 > 97\%$), AHF (99.95%) and PTFE all rose to certain extent.

The environmental protection tax law is to be implemented on 1 Jan., 2018. It will spell increased available funding for environmental protection spending by local government, and meanwhile should lead to better enforcement of the law (enterprises will be forced to manage pollutants and to reduce emissions / discharge). Chemical enterprises, as a key target, are expected to do a good job of environmental protection so as to achieve sustainable development and enhance competitiveness.

The 2017 HCFCs production / use quotas were released. Specifically, the production quotas are equal to that in 2016. The use quotas involve 5 industries in: use quotas for the remaining 3 businesses have been decreased, except PU foaming and room air conditioning industries. This is an indication that the Chinese government is increasing the application limitations, with an intention to force manufacturers to step up the eliminations, develop substitutes and achieve business transformation and upgrade.

The USD/RMB exchange rate in this newsletter is USD1.00=RMB6.9498 on 3 Jan., 2017, sourced from the *People's Bank of China*. All the prices mentioned in this newsletter will include the VAT, unless otherwise specified.

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Market Dynamics

Key policies for fluorochemical business in 2016

Summary: Last year, 2016, a succession of policies relating to the fluorochemical business were released. CCM has specifically selected 4 key policies for analysis, resource tax reform for the fluorite segment, the substitution of fluorine-enriched refrigerants, anti-dumping, and industry development plan.

I Fluorite tax reform

On 1 July, 2016, a resource tax on fluorite, which is levied based on value, was introduced with a tax rate of 1-6% (former: charged based on quantity, at USD3.04/t OR RMB20/t). In the meantime, the basis for taxation was modified, from "sales volume of raw ore" to "sales of raw ore and ore concentrate (OR raw ore based processed products)". Notably, the Chinese government is to completely remove the charging system, and to introduce more preferential tax policies, which is expected to result in an easing of pressure on domestic fluorite enterprises, stabilisation of prices, and gradual industry recovery.

II Substitution of fluorine-enriched refrigerants

In Jan. 2016, production / consumption quotas for hydrochlorofluorocarbons (HCFCs) for that year were released. Unlike in 2015, when a YoY reduction of 10% was witnessed, the HCFC production quota was not decreased, remaining the same as in 2015. Specifically, annual quotas for HCFC-22, HCFC-141b and HCFC-142b were 274,279 tonnes, 66,313 tonnes and 22,845 tonnes respectively.

However, consumption quotas for the refrigeration and air-conditioning and PU foaming segments in particular, were decreased.

- Refrigeration and air-conditioning: HCFC-22 quota down by 8.83% YoY to 67,059 tonnes
- PU foaming: HCFC-141b quota down by 27.25% YoY to 2,665 tonnes

The year marked the beginning of the 2nd phase of HCFC elimination in China. The Chinese government is planning to phase out 35% of the average 2009-2010 output between 2016 and 2020. The lack of change in production quotas in 2016 from the previous year was not indicative of a trend, and it is foreseeable that they will be reduced in the future.

At the end of Aug., the Foreign Economic Cooperation Office, Ministry of Environmental Protection released an exposure draft about the latest *First Catalogue of Recommended Substitutes for HCFCs*. The exposure draft included natural refrigerants, which CCM believes will play a dominant role in future substitution, including propane (R290), isobutene (R600a), carbon dioxide (R477), ammonia (R717) and cyclopentane.

On 10 Oct., the 28th conference of the parties of the *Montreal Protocol on Substances that Deplete the Ozone Layer* was held in Kigali, Ruanda. Nearly 200 countries / regions attended the meeting, during which they passed an amendment to the protocol in a bid to reduce the use of hydrofluorocarbons (HFCs).

This amendment is a warning to China's HFC industry, according to analyst CCM: "It is necessary for domestic HFCs manufacturers to accelerate production optimisation (repurposing facilities for premium marketed products) and phase out obsolete production capacity (so as to achieve cost reductions and increase profit), and to increase investment in the R&D of new



substitutes, hydrofluoroolefins (HFOs)." Meanwhile, natural refrigerants are expected to capture some of the market share lost by HFCs in the coming years.

On 27 Nov., the 77th meeting of the Multilateral Fund Executive Committee of the *Montreal Protocol on Substances that Deplete the Ozone Layer* was held in Montreal, Canada. The plan for China's 2nd phase of HCFC elimination, which is targeted at 4 key industries, commercial refrigeration and air conditioning, room air conditioners, polyurethane foam and extrusion polystyrene foam, was examined and passed.

So far, this 2nd phase plan has obtained funding of over USD500 million, including funding from the refrigeration maintenance industry plan and the cleaning industry plan.

III Anti-dumping

On 5 Aug., 2016, the United States International Trade Commission (USITC) notified the United States Department of Commerce (USDC) of their final ruling in the Chinese HFCs (incl. blends and components) anti-dumping suit.

Specifically, the USITC affirmed that material injuries/threats had been caused to local business by Chinese HFC blends, but found that injuries/threats from corresponding HFC components had not been caused. This signified that the US would levy anti-dumping duties on Chinese HFC blends, but not on individual HFC components.

In late Sept., the USDC announced an affirmative primary ruling in the anti-dumping investigation of 1,1,1,2-tetrafluoroethane (HFC-134a) imported from China, and determined the dumping margin at 137.23–188.94%.

On 1 Dec., the USDC announced a revision to the primary ruling regarding the Chinese-made HFC-134a anti-dumping case: the weighted average dumping margin of all Chinese exporters / manufacturers was increased to 232.30%.

It is expected that the USDC will announce their final ruling in Feb. 2017, after which the USITC will make a final determination regarding injury to industry in March.

In this HFC-134a anti-dumping case there is a large possibility that China will win again, according to analyst CCM. Having gained experience from the former case, domestic HFC-134a companies will be better able to handle this one. Besides, since the domestic HFC-134a market is currently recovering, companies should be more determined to unite as one and actively respond to the suit.

IV Industry development plan

In Aug. 2016, a goal was set for China's fluorochemical business during the 13th five-year period: to build a powerful fluorochemical nation (more rational business structure, greater potential for development and anti-risk capability) by 2020, by improving innovation and production technology, developing premium marketed products and extending the industry chain.

In particular, urgent demand for high added value and high performance fluorochemicals has been shown from light industry as well as the automobile, electronics, alternative energy, environmental protection and aviation industries. This indicates strong development potential for mid-marketed and premium fluoropolymers, new type refrigerants (HFOs), fine fluorochemicals and fluorine-enriched coatings.





On 18 Oct., the Ministry of Industry and Information Technology of the People's Republic of China officially released the *Petrochemical and Chemical Industry Development Plan (2016-2020)*.

CCM specifically paid attention to the innovative development of new chemical materials outlined in the plan. Key content relating to fluorochemicals is as follows:

1. Fluorine and silicone materials: advancement of the industrialisation of phenyl organosilicon monomer; specific development of premium marketed fluorine- and silicone-enriched resin / rubber, fluorine-enriched functional membrane materials, high quality fluorine- and silicone-enriched fine chemicals (such as high purity electronic chemicals, fluorine- and silicone-enriched surface active agents, and fluorine- and silicone-enriched intermediates); hastened development of low GWP ozone depletion substance (ODS) substitutes.
2. Functional membrane materials: development of medium and premium marketed Li-ion battery separators, flexible package membrane materials, polyvinyl fluoride (PVF) and polyvinylidene fluoride (PVDF) backplane membranes, fluorine-enriched proton exchange membranes and polaroids for thin film transistor-liquid crystal displays (TFT-LCD).
3. Electronic chemicals: development of liquid crystal materials (fluorine-enriched liquid crystal intermediate) for panel displays; development of innovative lithium salts such as lithium bis(fluorosulfonyl)imide (LiFSI), and electrolyte solvent such as fluoroethylene carbonate for Li-ion battery.

On 19 Dec., the State Council released the *13th Five-year Plan for the Development of Strategically Emerging Industries*, listing goals, key tasks and policies & measures for the industry's development for 2016-2020.

CCM believes that the fluorochemical business, which strongly supports strategically emerging industries, will follow these industries footsteps and grow rapidly. For instance, many fluorochemicals are needed during the manufacturing of a core component of alternative energy vehicles, Li-ion batteries, including PVDF adhesive, PVDF coating, lithium hexafluorophosphate (LiPF₆) and lithium bis(trifluoromethanesulphonyl)imide (LiTFSI).

China's HCFC-22 price to fall again in early 2017

Summary: At the end of 2016, China's HCFC-22 price stopped falling and made a rebound, impacted by the deficient production quota and the active stock-up by downstream enterprises. CCM believes that the price will fall again during Jan.-Feb. 2017.

By Dec. 2016, most of the Chinese difluorochloromethane (HCFC-22) manufacturers, such as Limin Chemicals Co., Ltd., Zhejiang Sanmei Chemical Industry Co., Ltd. and Zhejiang Pengyou Chemical Co., Ltd., used up their production quotas.

However, the downstream refrigeration and air conditioner manufacturers were busy stocking up, which encouraged HCFC-22 producers and traders to increase the shipments and raise quotations: ex-works price up by 1.07% MoM to USD1,326/t (RMB9,144/t) on average, and even to USD1,367/t (RMB9,500/t) in part.

By the end of Dec. 2016, only Shandong Dongyue Chemical Co., Ltd. (Shandong Dongyue), Jiangsu Meilan Chemical Co., Ltd. (Jiangsu Meilan) and Zhejiang Juhua Co., Ltd. (Zhejiang Juhua) had production quotas left and basically maintained full capacity operation.



Figure 1: Ex-works price of HCFC-22 in China, Jan.–Dec. 2016



Note: HCFC-22 stands for difluorochloromethane.

Source: CCM

CCM believes that the price recovery of HCFC-22 this time is temporary, "The price will fall again during Jan.-Feb. 2017, and the manufacturers will make limited profits." This is mainly because:

1. Manufacturers including Shandong Dongyue, Jiangsu Meilan and Zhejiang Juhua are now busy fulfilling orders signed before, and are having no supplies of spot HCFC-22. That is to say, the shipments are based on the low prices contracted already, and very few orders are made for the raised quotations in reality.
2. Downstream refrigeration and air conditioner manufacturers have stocked up for their low priced orders before mostly, and will not continue large-quantity stock-up in early 2017 (off-season).
3. The production quotas for 2017 have been unveiled, and the tight supply will be eased.

Company Dynamics

Suzhou Fluolyte to raise fund for LIFSI project construction

Summary: In Jan. 2017, Suzhou Fluolyte released a proposal for private placement, a move intended to raise funding for its main business development.

On 11 Jan., 2017, Suzhou Fluolyte Co., Ltd. (Suzhou Fluolyte) announced a plan to issue <=2.50 million shares (priced at USD1.87/share (RMB13/share)) to <=35 targets, for a funding of <= USD4.68 million (RMB32.50 million).

Specifically, USD863,334 (RMB6 million) will be payment for factory construction, USD2.73 million (RMB19 million) for equipment purchase, installation and commissioning and USD1.08 million (RMB7.50 million) as working capital.

"The funding will help optimise our financial structure, improve the profitability and enhance the anti-risk capability," stated Suzhou



Fluolyte, "The development of our main business will be stepped up."

Suzhou Fluolyte, established in 2010, is mainly engaged itself in the R&D, production and sales of Li-ion battery electrolytes. Now it is mainly selling lithium bis(fluorosulfonyl)imide (LiFSI), and its derivatives and ionic liquids.

According to CCM's research, LiFSI is a new substitute for lithium hexafluorophosphate (LiPF₆), a leading raw material for Li-ion battery electrolyte currently. It boasts high thermal stability, hydrolysis resistance (no generation of hydrogen fluoride (HF)), and fine conductivity, and is a solution for technical problems such as short cycle life of power Li-ion battery (especially under high temperature) and large safety risks.

Suzhou Fluolyte now is capable of the commercialised production of LiFSI, following 4+ year pilotscale experimentation. In June 2015, it started constructing its 1,000 t/a LiFSI project – the 1st phase (200 t/a) was put into operation in June 2016 and the construction will be finished completely in June 2017.

However, Suzhou Fluolyte is now facing large capital pressure. The fund raising this time is closely related to its future business operation.

In view of its orders to date, the company is expected to make sales of about USD2.88 million (RMB20 million) in 2017, and realise a gross profit margin of about 30%. However now it needs large labour and material resources for the market exploitation. When costs for raw materials and expenses for distribution and administration are included, there will be a fund shortage of over USD1.01 million (RMB7 million) in 2017.

Shanghai 3F expects loss in 2016

Summary: In Jan. 2017, Shanghai 3F expected a loss in full-year 2016. This loss continued for 2 consecutive years, indicating that its shares will be highlighted for delisting risk following the official release of its 2016 financial report.

On 10 Jan., 2017, Shanghai 3F New Materials Co., Ltd. (Shanghai 3F, stock code: 600636) expected a loss during 1 Jan.-31 Dec. 2016, at about USD43.17 million (RMB300 million).

This will be a warning to the company. In 2015, it recorded a negative figure also, at -USD44.75 million (RMB311.01 million). Hence, its shares will be highlighted for delisting risk following its official release of the 2016 financial report, since it suffered losses for 2 consecutive years.

The delisting risk means that its Chinese share name "三爱富" will be marked with "**ST", to differentiate from other companies. During this warning period, the share price is restricted to a rise / fall of 5%, vs. 10% originally.

According to CCM's research, Shanghai 3F's expected loss in 2016 can be mainly attributed to its asset impairment, scrap fixed assets and dismantling of fixed assets, which caused total expenses of about USD43.17 million (RMB300 million). In addition, its staff reallocation also caused large expenses. All this is a result of the complete production suspension of the Wujing production base in Shanghai, the scrap of the production equipment of the Changshu Tetrafluoro Plant, and the reorganisation of key assets.

More specifically, the production suspension will start from 30 June, 2017, involving production equipment for fluororubber, fluorinated ethylene propylene (FEP) and polytetrafluoro ethylene (PTFE) respectively.





The scrap in the Changshu plant is mainly because a set of PTFE production equipment was appraised to be unavailable permanently, following an occurrence of production accident.

In addition, Shanghai 3F decided to discard part of the $\geq 10,000$ t/a PTFE production equipment which was constructed in 2015 for production expansion and was only capable of production of ordinarily graded PTFE, and to introduce advanced production equipment / process for improvement.

In regards to the reorganisation, as of 10 Jan., 2017, the investigation of target assets was still going on. In the future, the fluorochemical business of Shanghai 3F will be transferred to Shanghai Huayi Group Corporation Limited.

Do-Fluoride makes progress in AEV business

Summary: In Jan. 2017, Do-Fluoride announced that one of its subsidiaries AEVs had been listed in the latest government recommended automobile catalogue. CCM believes that this year, 2017, will be the first year in which Do-Fluoride accelerates AEV business development and turns a profit, given that a proposal to adjust subsidies offered has already been issued.

In early Jan. 2017, Do-Fluoride Chemicals Co., Ltd. (Do-Fluoride) announced that its subsidiary, Hebei Hongxing Automobile Manufacturing Co., Ltd. (Hebei Hongxing) had had its product listed in the 5th *Catalogue of Alternative Energy Vehicle Recommended for Promotion and Application*, which was released by the Ministry of Industry and Information Technology of the People's Republic of China (MIIT) at the end of Dec. 2016.

The product in question is a "Hongxing" all-electric van (Type HX5029XXYAVEV), which has been designed chiefly for the covered transportation of goods.

This listing is beneficial to Hebei Hongxing's business development and expansion, and lays the foundation for its future development to a certain extent. Meanwhile, it is a strong counter to the rumour it has stopped manufacturing alternative energy vehicles (AEV).

An automobile manufacturing plan was unveiled by Do-Fluoride in Aug. 2015, the aim of which was to produce 14,000 electric vehicles in 2016, 30,000 in 2017 and 100,000 in 2018. However, the company fell short of its 2016 target by a significant margin, and this could make future targets harder to meet.

However, in recent years, Do-Fluoride has made great efforts and achievements in the AEV business. CCM believes that this year, 2017, will be the first year in which the company steps up AEV business development and starts to turn a profit.

This is mainly because:

1. Proposal to adjust subsidies already issued

In 2016, the Chinese government suspended the offering of subsidies after a check on "subsidy cheats" was conducted. This meant that most of the subsidies for 2015 and all subsidies for 2016 were not provided, resulting in AEV manufacturers having to pass on the subsidies to their clients themselves, and facing increasingly heavy capital pressure. Some manufacturers were even in arrears to their battery suppliers, or were forced to reduce / suspend production.





Do-Fluoride were no exception, and attributed the slowdown in developing its AEV business to the lack of subsidies provided, "Without subsidies it is difficult for us to turn a profit currently. It is not the right time to launch products."

At the end of Dec. 2016, China's Ministry of Finance, Ministry of Science and Technology, National Development and Reform Commission and MIT jointly issued the *Notice to Adjust Subsidy Policy for Alternative Energy Vehicle Promotion and Application*. Although the value of subsidies has declined by 20-40% following this adjustment, at least companies are now being subsidised, helping them to stabilise their capital chains and steadily advance their businesses.

2. Enhanced funding capability

Earlier, in Aug. 2016, Do-Fluoride increased Hebei Hongxing's capital by USD29.85 million (RMB200 million), a move intended to strengthen the latter's ability to develop technology and improve product performance. Due to this, Do-Fluoride now holds a 85.294% stake in this subsidiary.

Later, in Nov. 2016, Do-Fluoride supplemented the working capital of its fully-owned subsidiary Do-Fluoride (Jiaozuo) New Energy Technology Co., Ltd. (which specifically produces Li-ion batteries) by using reserves of USD43.17 million (RMB300 million). This effectively decreased the financial cost.

3. Improved supporting facilities

In recent years, Do-Fluoride has carried out business activities in the AEV segment frequently. For instance, the company's expanded lithium hexafluorophosphate (LiPF₆) production facility, the total production capacity of which has been doubled from 3,000 t/a to 6,000 t/a, is expected to go into operation in Q1 2017; its 300 million Ah/a high energy power Li-ion battery pack project, investment in which totals over USD20.14 million (RMB140 million) so far, began operations at the end of Q3 2015.

In addition, Do-Fluoride announced the investment of USD741.03 million (RMB5.15 billion) in a new AEV power assembly project (production capacity: 300,000 unit/a) in Nov. 2016, intending to better control core AEV technology.

Jinding Group establishes partnership with Pujiang Fluoroplastic

On 9 Jan., 2017, Hong Kong Jinding International Group (Jinding Group) held a signing ceremony with Zhejiang Pujiang Fluoroplastic Co., Ltd. (Pujiang Fluoroplastic) in Pujiang County, Zhejiang Province, regarding their strategic cooperation.

During this, speeches were made on the economic value and development trend of polytetrafluoro ethylene (PTFE) material. It is expected that the cooperation will contribute to the production of upstream fluoroplastics and the application in the downstream, which will furthermore help increase their profits.

Background

Jinding Group, founded in 2015, grew out of Guangdong Foshan Hygiene Products Co., Ltd. and now is mainly involved in the R&D, production and sales of sanitary products.

Pujiang Fluoroplastic, founded in 1998, is developing, producing and selling specially modified PTFE sealing materials of high / low temperature resistance.





Jiangxi Zhaohui constructing fluoroplastics project

In early Jan. 2017, Jiangxi Zhaohui Fluorine Plastic Products Co., Ltd. (Jiangxi Zhaohui) announced its active construction of a fluoroplastics project (production capacity: 1 million piece/a), which is expected to be put into operation in May 2018.

Reportedly, this project, with a total investment of USD17.27 million (RMB120 million), is located in the Ningdu Industrial Park (in Jiangxi Province). Specifically, polytetrafluoro ethylene (PTFE) is used a raw material for products applied in fields of chemicals, biopharmaceuticals, electronics / electric appliances, and pharmaceutical machine.

Chase Plastics, distributor of Solvay in North America

On 1 Jan., 2017, Solvay S.A. (Solvay) established a partnership with Chase Plastics Ltd. (Chase Plastics), from which the latter will be a distributor of the former in North America, for its Algoflon[®]L and Polymist[®] series (both are polytetrafluoro ethylene (PTFE) ultrafine powders).

Reportedly, fine separation technology is applied in the 2 product series, which are mainly used as additives for the modifications of the production processes of plastics and rubber and are aimed at effectively preventing wearing, scratching and adhesion, and significantly improving the internal lubrication and demoulding effect of the products.

Thanks to this cooperation, Solvay will be enabled to expand its business in North America, by giving full play to its partner's sales network – the number of clients has amounted to 2,500+ so far – in this area.

3F Zhonghao subsidised for HFC-23 destroying

At the end of Dec. 2016, Shanghai 3F New Materials Co., Ltd. (Shanghai 3F) announced the receipt of a subsidy of USD6.10 million (RMB42.36 million) by its subsidiary Changshu 3F Zhonghao New Chemical Materials Co., Ltd. (3F Zhonghao) for the destroying of trifluoromethane (HFC-23).

This subsidy, from the Ministry of Finance of the People's Republic of China, will be included as non-operating revenue in 2016, according to Shanghai 3F.

3F Zhonghao, founded in 2001, is mainly producing anhydrous hydrogen fluoride (AHF), hexafluoropropylene (HFP), pentafluoroethane (HFC-125), difluoromethane (HFC-32), chlorotrifluoroethylene (CTFE) and coating purpose fluorocarbon resin.

Political Factors

China's HCFCs production / use quotas in 2017

Summary: In Jan. 2017, the MEP unveiled the HCFCs production / use quotas in 2017. Specifically, the production quotas are equal to that in 2016.

On 6 Jan., 2017, the Ministry of Environmental Protection of the People's Republic of China (MEP) unveiled the production / use quotas for hydrochlorofluorocarbons (HCFCs) this year, involving 5 products – difluorochloromethane (HCFC-22), dichlorofluoroethane (HCFC-141b), chlorodifluoroethane (HCFC-142b), dichlorotrifluoroethane (HCFC-123) and





chlorotetrafluoroethane (HCFC-124).

Specifically, the production quotas are equal to that in 2016: 274,279 tonnes for HCFC-22, 66,313 tonnes for HCFC-141b and 22,845 tonnes for HCFC-142b.

The use quotas involve 5 industries in, namely room air conditioning (32 companies), industrial and commercial refrigeration and air conditioning (17), polyurethane (PU) foaming (13), extrusion polystyrene foaming (13) and cleaning (1).

Table 1: Production quota of difluorochloromethane (HCFC-22) in China, 2017, tonne

No.	Company	Production quota	Quota for domestic use
1	Shandong Dongyue Chemical Co., Ltd.	80,802	52,459
2	Jiangsu Meilan Chemical Co., Ltd.	56,713	46,412
3	Zhejiang Quhua Fluor-Chemistry Co., Ltd.	44,878	35,402
4	Arkema (Changshu) Fluorochemical Co., Ltd.	16,159	1,463
5	Zhejiang Sanmei Chemical Industry Co., Ltd.	14,400	7,967
6	Changshu 3F Zhonghao New Chemical Materials Co., Ltd.	13,006	6,846
7	Zhejiang Lanxi Juhua Fluorine Chemicals Co., Ltd.	12,506	11,104
8	Linhai Limin Chemicals Co., Ltd.	12,393	6,935
9	Zigong Honghe Chemical Co., Ltd.	8,574	7,613
10	Jinhua Yonghe Fluorochemical Co., Ltd.	5,925	5,099
11	China Fluoro Technology Co., Ltd.	5,638	5,006
12	Zhejiang Pengyou Chemical Co., Ltd.	2,027	1,594
13	Jiangxi Sanmei Chemical Co., Ltd.	1,258	1,117
Total		274,279	189,017

Note: The quota for domestic use is part of production quota, indicating that its corresponding products are for domestic sale in China.

Source: Ministry of Environmental Protection of the People's Republic of China & CCM

Table 2: Production quota of dichlorofluoroethane (HCFC-141b) in China, 2017, tonne

No.	Company	Production quota	Quota for domestic use
1	Zhejiang Sanmei Chemical Industry Co., Ltd.	34,759	20,835
2	Changshu 3F Fluorochemical Industry Co., Ltd.	15,678	11,317
3	Zhejiang Juhua Electrochemical Plant	6,722	4,420
4	Zibo Luxuan Industry and Trade Co., Ltd.	5,985	5,985
5	Zhejiang Sanhuan Chemical Co., Ltd.	3,169	2,015
Total		66,313	44,572

Note: The quota for domestic use is part of production quota, indicating that its corresponding products are for domestic sale in China.

Source: Ministry of Environmental Protection of the People's Republic of China & CCM

Table 3: Production quota of chlorodifluoroethane (HCFC-142b) in China, 2017, tonne

No.	Company	Production quota	Quota for domestic use
1	Shandong Hua'an New Material Co., Ltd.	6,000	5,248
2	Shandong Dongyue Chemical Co., Ltd.	4,592	3,277
3	Zhejiang Sanmei Chemical Industry Co., Ltd.	4,162	3,206
4	Zhejiang Lantian Environmental Protection Fluoro Materials Co., Ltd.	2,722	1,963
5	Changshu 3F Zhonghao New Chemical Materials Co., Ltd.	2,298	1,910
6	Taixing Meilan Chemical Co., Ltd.	1,485	861
7	Zhejiang Arsen Chemical Co., Ltd.	1,200	1,200
8	Inner Mongolia 3F Wanhao Fluorine Chemical Co., Ltd.	327	281
9	Changshu 3F Fluorochemical Industry Co., Ltd.	46	40
10	Zhejiang Sanhuan Chemical Co., Ltd.	13	11
Total		22,845	17,997

Note: The quota for domestic use is part of production quota, indicating that its corresponding products are for domestic sale in China.

Source: Ministry of Environmental Protection of the People's Republic of China & CCM



Table 4: Production quota of dichlorotrifluoroethane (HCFC-123) & chlorotetrafluoroethane (HCFC-124) in China, 2017, tonne

Company	Product	Production quota	Quota for domestic use
Zhejiang Lantian Environmental Protection Hi-Tech Co., Ltd.	HCFC-123	2,819	432
	HCFC-124	401	139

Note: The quota for domestic use is part of production quota, indicating that its corresponding products are for domestic sale in China.

Source: Ministry of Environmental Protection of the People's Republic of China & CCM

Table 5: Use quotas of HCFCs in China, 2017, tonne

No.	Industry	Product	Use quota	YoY change
1	Room air conditioning	HCFC-22	58,154	+0.48%
2	Industrial and commercial refrigeration and air conditioning	HCFC-22	8,541.8	-6.98%
		HCFC-123	585	0.00%
3	Polyurethane foaming	HCFC-141b	3,133	+17.56%
		HCFC-22	3,852	-22.43%
4	Extrusion polystyrene foaming	HCFC-142b	1,835	-7.56%
		HCFC-141b	360	0.00%

Note: HCFC-22 stands for difluorochloromethane; HCFC-123 stands for dichlorotrifluoroethane; HCFC-141b stands for dichlorofluoroethane; HCFC-142b stands for chlorodifluoroethane.

Source: Ministry of Environmental Protection of the People's Republic of China & CCM

CCM believes that the Chinese government is increasing the limitations on downstream applications, with an intention to force manufacturers to step up the phaseout of HCFCs and develop substitutes for business transformation and upgrade.

In reality, the use quotas for the remaining 3 businesses have been decreased, except PU foaming and room air conditioning industries. Specifically, the pharmaceutical aerosol business has been delisted, and accordingly the use quotas of HCFC-22 and HCFC-141b have been decreased by 2,300 tonnes and 600 tonnes respectively.

In view of the current HCFCs substitution technologies, hydrofluorocarbons (HFCs) technology is a mainstream: both its production process and application are mature.

However in Oct. 2016, the 28th meeting of parties for the *Montreal Protocol on Substances that Deplete the Ozone Layer* passed the revised proposal for HFCs reductions, signalling that it is a necessity for China to promote the control and elimination of HFCs in the future.

Meanwhile, the application of natural refrigerants will play a leading role, according to the *First Catalogue of Recommended Substitutes for HCFCs (Exposure draft)* released at the end of Aug. 2016. For instance,

- Propane (R290), isobutene (R600a), carbon dioxide (R477) and ammonia (R717) as refrigerants
- R477, cyclopentane, n-pentane and isopentane as foaming agents

Certainly, the 4th generation fluorine-enriched refrigerants, HFOs, are a focus during future development. Particularly, 1,1,1,4,4,4-hexafluorobutene (HFO-1366mzz) and 1-chloro-3,3,3-trifluoropropene (HCFO-1233zd) have also been listed in the aforementioned exposure draft as recommended substitutes for HCFCs foaming agents.



Environmental protection tax law to be implemented in Jan. 2018

Summary: In late Dec. 2016, China officially released the environmental protection tax law, which is to be implemented on 1 Jan. 2018. The new law replaces the existing pollutant discharge fee system with an environmental protection tax system, some of the revenue from which will go to local government, and brings with it greater enforcement of the law.

On 25 Dec., 2016, the 25th meeting of the 12th National People's Congress Standing Committee passed the Environmental Protection Tax Law of the People's Republic of China, which is to be implemented on 1 Jan., 2018. Specifically, taxable pollutants, taxpayers, tax amounts and items exempt from taxation are defined in the new law.

The new law is intended to replace the existing pollutant discharge fee system, which was introduced in 1979 and targets 4 pollutant categories, air, water, solid waste and noise. The discharge fee system has been of great significance to the prevention and control of environmental pollution. To ensure a smooth transition from the old "fee" system, actual cost to potential taxpayers and the scope of charges will remain the same, at least initially: existing fee payers will become taxpayers, and taxable items, taxation standards, and the basis for tax assessment will be set to correspond with those currently existing.

In regards to taxation standards specifically, they should be equivalent to current fee standards for pollutant discharge:

- Air pollutants: USD0.17–1.73 (RMB1.20–12) per pollutant equivalent
- Water pollutants: USD0.20–2.01 (RMB1.40–14) per pollutant equivalent
- Solid waste: USD0.72–143.89 (RMB5–1,000) per tonne

CCM believes that the implementation of the environmental protection tax law will spell increased available funding for environmental protection spending by local government, and meanwhile should lead to better enforcement of the law (enterprises will be forced to manage pollutants and to reduce emissions / discharge). Chemical enterprises, as a key target, are expected to do a good job of environmental protection so as to achieve sustainable development and enhance competitiveness.

More specifically,

1. Certain taxes will provide income for local government, which is encouraged by the central government to improve taxation standards. This indicates that available funding will increase greatly by an estimated total of USD7.19 billion (RMB50 billion) annually.

2. From 1 Jan., 2018, taxation authorities will be responsible for tax collection, which will allow for greater enforcement of the law and should solve problems that exist within the current pollutant discharge fee system, such as inappropriate intervention by local government, poor information transparency and difficulties in fee collection. Meanwhile, the introduction of new legislation will ensure that enterprises comply with the new taxation system. Enterprises currently face fines or are given tight payment deadlines when defaulting on or even refusing to pay pollution discharge fees. However, such behaviour will be considered tax evasion under the new law, and those involved will be held criminal responsibility.

In order to encourage polluting enterprises to reduce pollution and make improvements to their businesses, the environmental tax law offers more tax breaks and exemptions:

- Air & water pollutants: taxpayers can apply for a 25% tax reduction if the concentration of taxable pollutants they discharge is





detected to be 30% less than national or provincial standards, and a 50% tax break for a 50% reduction in the concentration of taxable pollutants

- Solid waste: tax is exempt for solid waste which is recycled by taxpayers in accordance with national or local environmental standards

In other words, the fewer pollutants are discharged, the less tax has to be paid. This can push enterprises to take the initiative on increasing pollutant treatment investment and to try their best to meet discharge standards.

Technology

Jiangsu Zhongtian passes scientific achievement appraisal on PVDF membrane

Summary: In Jan. 2017, Jiangsu Zhongtian passed the scientific achievement appraisal for its independently developed PVDF membrane for PV back-plate. Thanks to its high quality and low cost, the membrane is expected to be supported by government policies which are now targeted at reducing costs for PV modules, during the promotion of mass application.

On 17 Jan., 2017, Jiangsu Zhongtian Technology Co., Ltd. (Jiangsu Zhongtian) announced the pass regarding the scientific achievement appraisal on its independently developed extra weather resistance polyvinylidene fluoride (PVDF) back-plate membrane by the Ministry of Industry and Information Technology of the People's Republic of China.

"The company has already developed a set of equipment for full-closed and high-automation production, and has developed bilayer co-extrusion blow moulding technology for the mass production. The product pass rate is up to 98%+, and the production is of low cost," stated experts during the appraisal, "In addition, it has constructed a specific cleaning workshop, for which the quantity of fisheyes of the finished PVDF membrane reaches <150 per 3,000 m. "

Reportedly, Jiangsu Zhongtian's PVDF membrane is Type ZTT-JMF, and is tested and applied by downstream enterprises such as Trina Solar Limited, JA Solar Holdings Co., Ltd. and Canadian Solar Inc.

Jiangsu Zhongtian, founded in 1992, started the alternative energy business in 2008, and achieved its coordinated development of telecommunications and power grid.

PVDF membrane, a key raw material for the manufacturing of solar energy photovoltaic (PV) back-plate, has been listed in the *Made in China 2025* for specific development.

According to a certain institute, the global installed capacity of PV power will maintain a growth of about 100 GW per year before 2030. That is to say, every year about 1.3 billion m² of PVDF membrane will be needed – the market size will reach USD0.94–1.31 billion (RMB6.50–9.10 billion) based on a price of about USD0.72–1.01/m² (RMB5–7/m²).

However, China, as the world's largest PV module manufacturing country, relies strongly on the imports of PVDF membrane from France, South Korea, Japan, etc.

The PVDF membrane developed by Jiangsu Zhongtian is expected to be supported by government policies. "The company achieves the mass production of high quality and low cost PVDF membrane, able to meet the demand for long cycle life, and catch





up with the trend for cost reduction. Hence, the membrane should be promoted widely," said Wang Bohua, secretary general of the China Photovoltaic Industry Association.

According to CCM's research, Jiangsu Zhongtian is now operating at a production capacity of 60 million m²/a. It plans to expand the capacity to 200 million m²/a within 3 years.

Honeywell: over 15,000 supermarkets using R407F in world

On 10 Jan., 2017, Honeywell International Inc. (Honeywell) announced the repurposings of refrigeration systems by over 15,000 supermarkets in the world and their use of Genetron[®] Performax[™] LT (R407F, a mixture of 1,1,1,2-tetrafluoroethane (HFC-134a), pentafluoroethane (HFC-125) and difluoromethane (HFC-32)) as of the end of Dec. 2016.

Reportedly, R407F is mainly used to substitute R404A (a mixture of HFC-125, HFC-134a and trifluoroethane (HFC-143a)), R507 (a mixture of HFC-125 and HFC-143a), R407A (a mixture of HFC-125, HFC-134a and HFC-143a) and HCFC-22, which are being eliminated, impacted by the EU's *F-Gas Regulation*.

Meanwhile, the refrigeration system using R407F has been tested to consume about 9% less energy than that using R407A, and about 14% over that using R404A.

Market Data Analysis

China's AHF (99.95%) price increases in Dec. 2016

Summary: In Dec. 2016, impacted by environmental policies and decreased supply, the quoted price of AHF in southern China rose significantly, followed by northern China.

In Dec. 2016, China's anhydrous hydrogen fluoride 99.95% (AHF (99.95%)) price increased: averaged ex-works price up by 3.30% MoM to USD907/t (RMB6,254/t).

This was a result of tight supply in southern China (such as Jiangxi, Fujian and Hunan provinces). Enterprises in succession suspended their production, due to the strict environmental inspection and the maintenance.

Following the price raising in southern China, the manufacturers in northern region also raised the quotations, by about USD14.39–28.78/t (RMB100–200/t).



Figure 2: Ex-works price of AHF (99.95%) in China, Jan.–Dec. 2016



Note: AHF stands for anhydrous hydrogen fluoride.

Source: CCM

CCM believes that the AHF (99.95%) price will maintain certain growths from Jan.-Feb. 2017.

This is mainly because:

The price of fluorite ($\text{CaF}_2 > 97\%$), a key raw material, has kept small rises since the end of 2016, and is expected to continue rising due to the continuously low temperature, and the production suspension during the Spring Festival (late Jan. 2017). This will offer strong cost support to AHF (99.95%).

The fluorine-enriched refrigerant business increased the production at the end of 2016, mainly because of the strong demand from refrigeration equipment and air conditioner manufacturers who intended to stock up. This is hoped to last till the Spring Festival. For instance, the average operating rate of difluorochloromethane (HCFC-22) was up by nearly 10 percentage points to 78% in Dec. 2016.

In addition, the AHF (99.95%) manufacturers are now firmly determined to raise quotations, in light of the frequent falls since H2 2016. "The raising will show in the Jan. orders and the price will be up to \geq USD935/t (RMB6,500/t)," commented a trade source.

China's PTFE price rises significantly in Dec. 2016

Summary: In Dec. 2016, China's PTFE price rose significantly, impacted by the decreased supply and the increased raw material price.

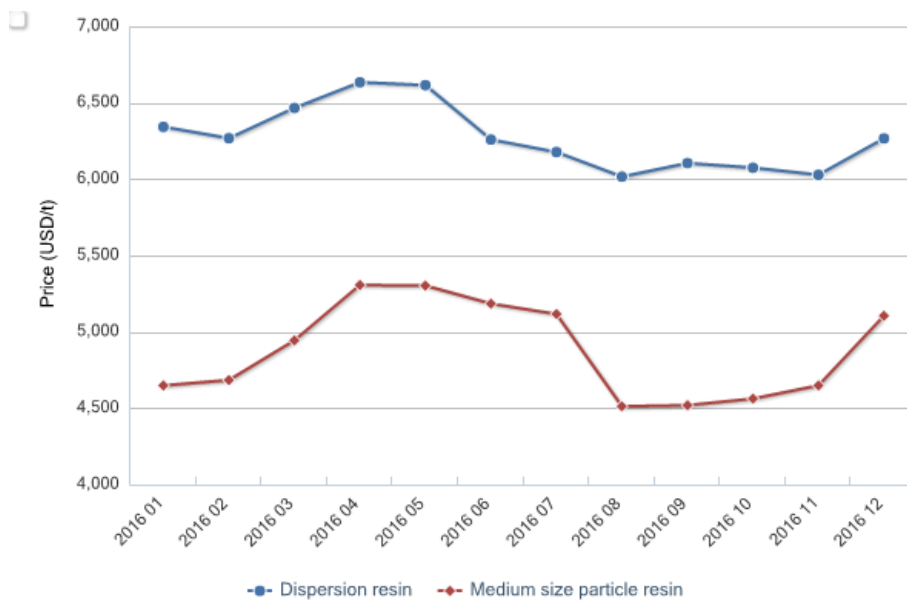
In Dec. 2016, China's polytetrafluoro ethylene (PTFE) price rose significantly: the ex-works price of PTFE dispersion resin and PTFE medium size particle resin averaged USD6,268/t (RMB43,223/t) and USD5,107/t (RMB35,217/t) respectively, up by 3.95% and 9.83% MoM.

This can be mainly attributed to:

1. Decreased supply. Many manufacturers in Shandong Province suspended production in late Dec., impacted by the central environmental inspection, and some manufacturers were forced by the sluggish demand for byproduct hydrochloric acid and the subsequently rising stocks, to limit production. In addition, manufacturers decreased the production of PTFE and instead, increased the production of hexafluoropropylene (HFP), which was demanded increasingly and was also based on raw material tetrafluoroethylene (TFE).

2. Rebounded price of raw material. The price of difluorochloromethane (HCFC-22) recovered by 1.07% MoM to USD1,326/t (RMB9,144/t), thanks to the strong demand from downstream refrigeration equipment and air conditioner manufacturers who intended to stock up.

Figure 3: Ex-works prices of PTFEs in China, Jan.–Dec. 2016



Note: PTFE stands for polytetrafluoroethylene.

Source: CCM

CCM believes that China's PTFE price will continue rising from Jan.-Feb. 2017.

This is mainly because:

1. The supply will decrease further, impacted by the environmental policies and the coming Spring Festival (late Jan.). Meanwhile, the demand will increase certainly, since most of the downstream fluoroplastics manufacturers will carry out stock-up before the festival.
2. The price of HCFC-22 will rise slightly, supported by the increasing price of anhydrous hydrogen fluoride (AHF) 99.95%, a key raw material.

Import & Export

Import and export of major fluorochemicals in China in Nov. 2016

Table 6: Export volume of major fluorochemicals from China, Nov. 2016, tonne

Product	Nov.-16	Oct.-16	Nov.-15	MoM change	YoY change
Fluorite (CaF ₂ >97%)	8,037	20,739	9,021	-61.25%	-10.91%
Fluorite (CaF ₂ ≤97%)	16,932	14,589	14,221	+16.06%	+19.06%
HF	21,834	17,144	20,131	+27.36%	+8.46%
AlF ₃	12,122	9,006	10,760	+34.60%	+12.66%
HCFC-22	9,731	6,200	8,550	+56.95%	+13.81%
PTFE	1,960	1,993	1,583	-1.66%	+23.82%
LiPF ₆	68	38	30	+78.95%	+126.67%

Source: China Customs & CCM

Table 7: Average export price (FOB) of major fluorochemicals from China, Nov. 2016, USD/t

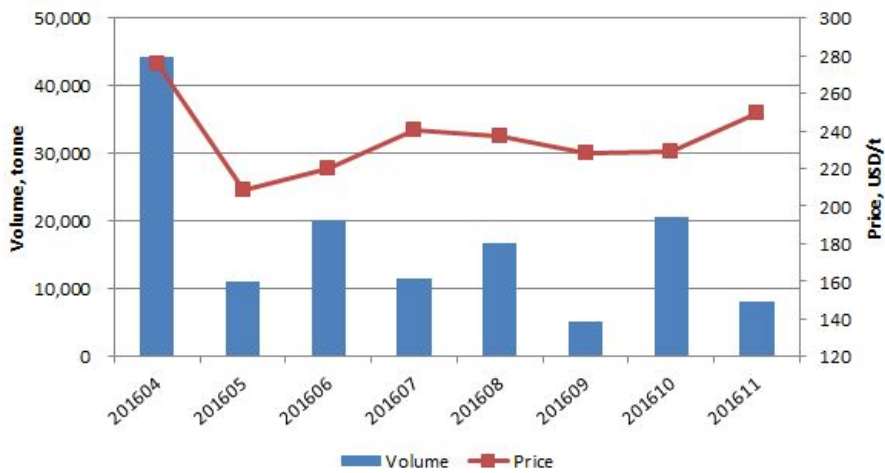
Product	Nov.-16	Oct.-16	Nov.-15	MoM change	YoY change
Fluorite (CaF ₂ >97%)	250	229	292	+9.17%	-14.38%
Fluorite (CaF ₂ ≤97%)	229	224	237	+2.23%	-3.38%
HF	932	973	1,019	-4.21%	-8.54%
AlF ₃	942	931	1,033	+1.18%	-8.81%
HCFC-22	1,392	1,438	1,648	-3.20%	-15.53%
PTFE	6,329	6,122	6,918	+3.38%	-8.51%
LiPF ₆	38,803	40,242	14,641	-3.58%	+165.03%

Note: FOB price = port price + handling and THC + exporter's profit - VAT rebate

Source: China Customs & CCM

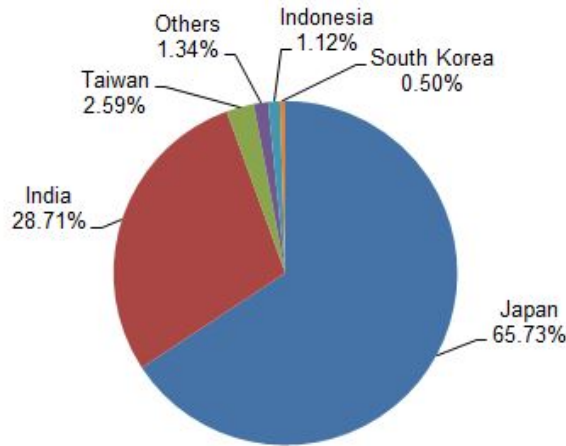
Fluorite

Figure 4: Exports of fluorite (CaF₂>97%) from China, April–Nov. 2016



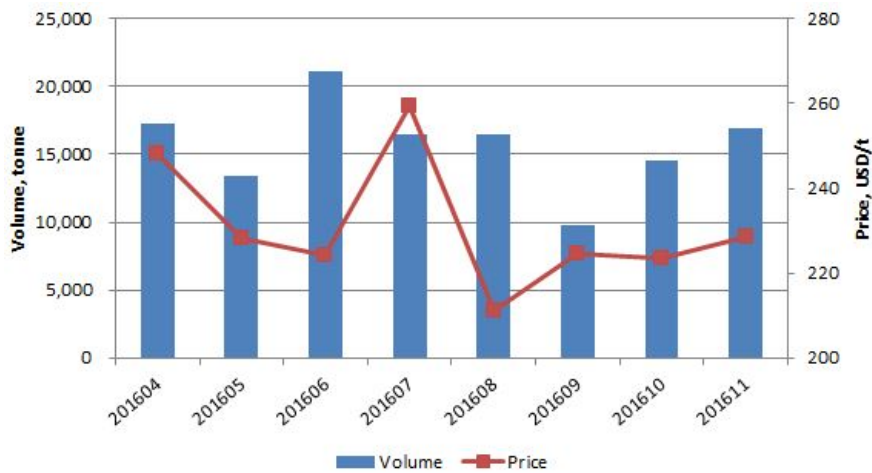
Source: China Customs & CCM

Figure 5: Selected export destinations of fluorite (CaF₂>97%) from China by volume, Nov. 2016



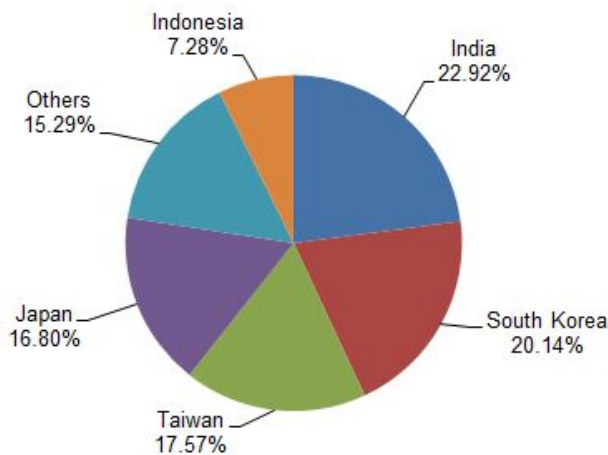
Source: China Customs & CCM

Figure 6: Exports of fluorite (CaF₂≤97%) from China, April–Nov. 2016



Source: China Customs & CCM

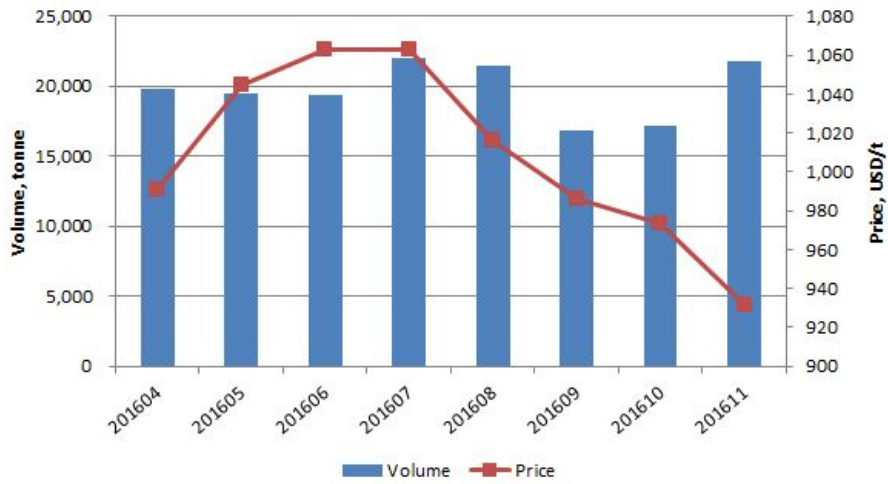
Figure 7: Selected export destinations of fluorite (CaF₂≤97%) from China by volume, Nov. 2016



Source: China Customs & CCM

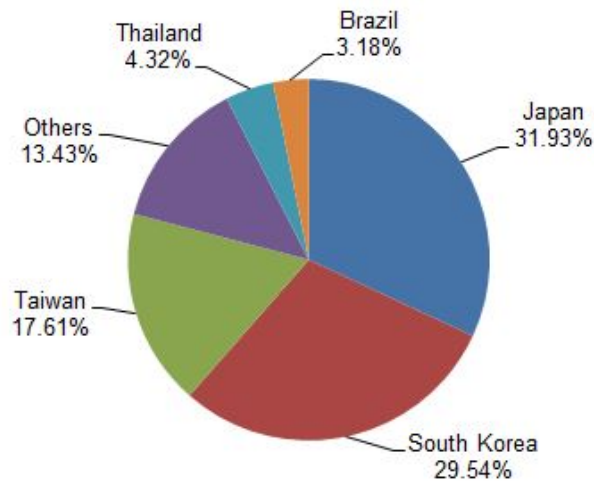
HF & AlF₃

Figure 8: Exports of HF from China, April–Nov. 2016



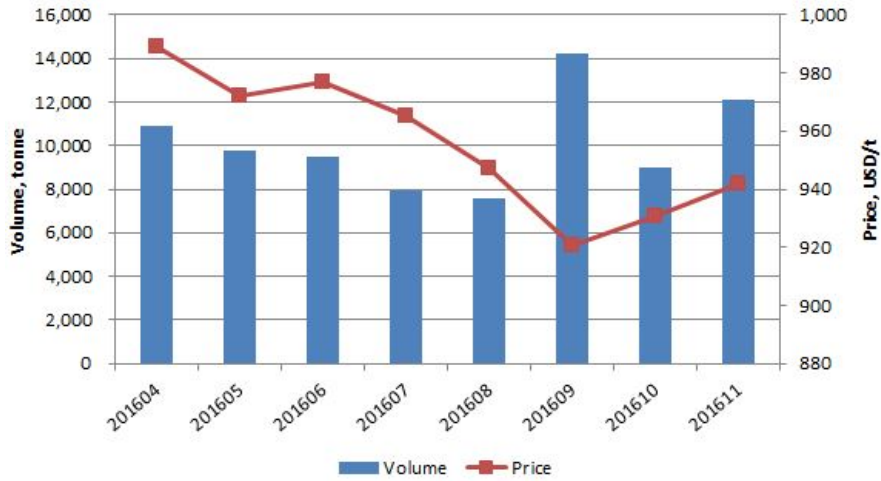
Source: China Customs & CCM

Figure 9: Selected export destinations of HF from China by volume, Nov. 2016



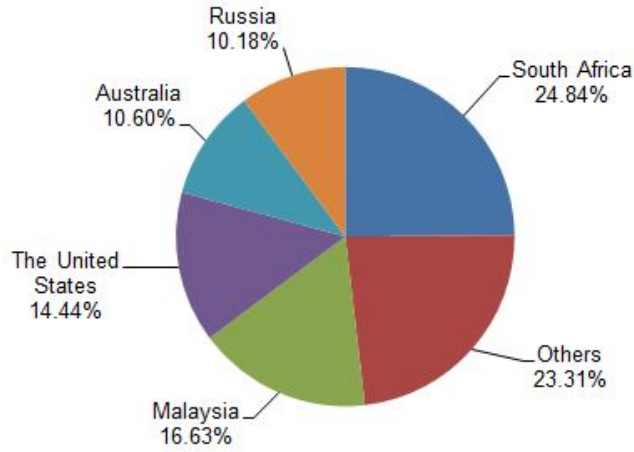
Source: China Customs & CCM

Figure 10: Exports of AIF3 from China, April–Nov. 2016



Source: China Customs & CCM

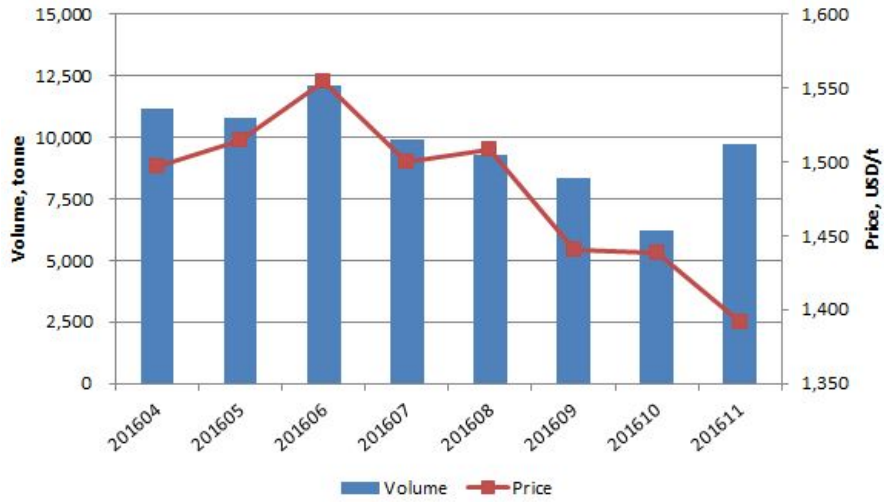
Figure 11: Selected export destinations of AIF3 from China by volume, Nov. 2016



Source: China Customs & CCM

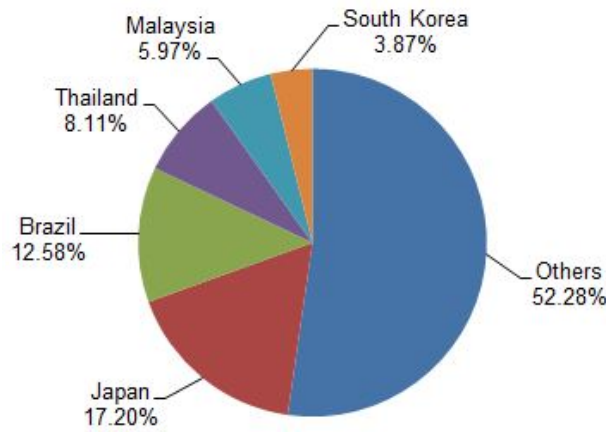
HCFC-22

Figure 12: Exports of HCFC-22 from China, April–Nov. 2016



Source: China Customs & CCM

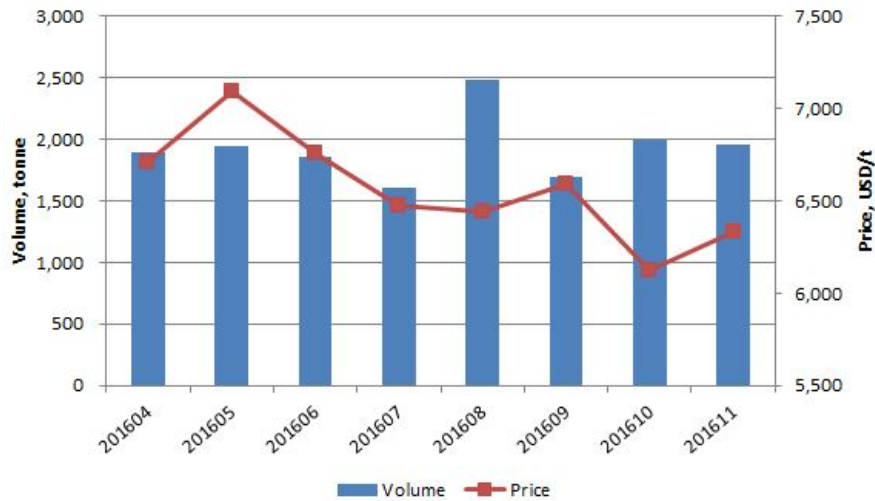
Figure 13: Selected export destinations of HCFC-22 from China by volume, Nov. 2016



Source: China Customs & CCM

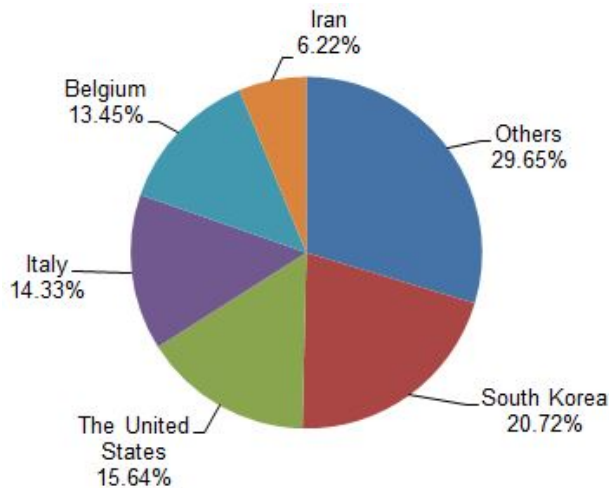
PTFE

Figure 14: Exports of PTFE from China, April–Nov. 2016



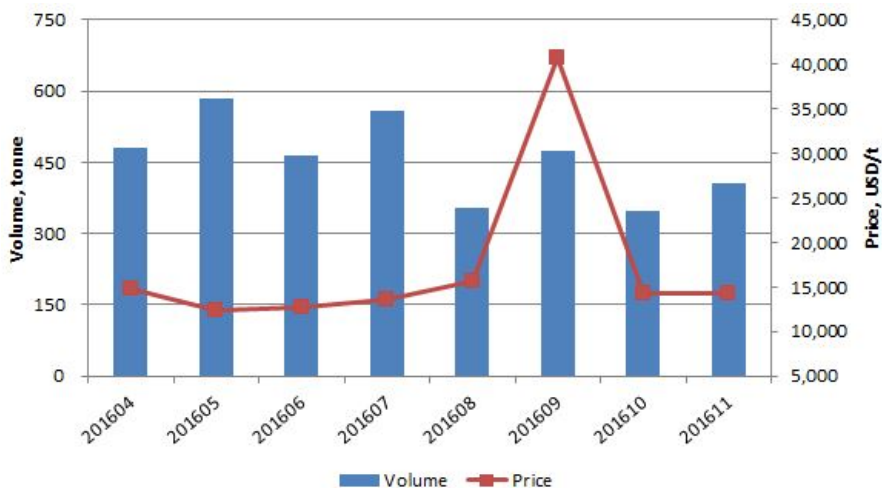
Source: China Customs & CCM

Figure 15: Selected export destinations of PTFE from China by volume, Nov. 2016



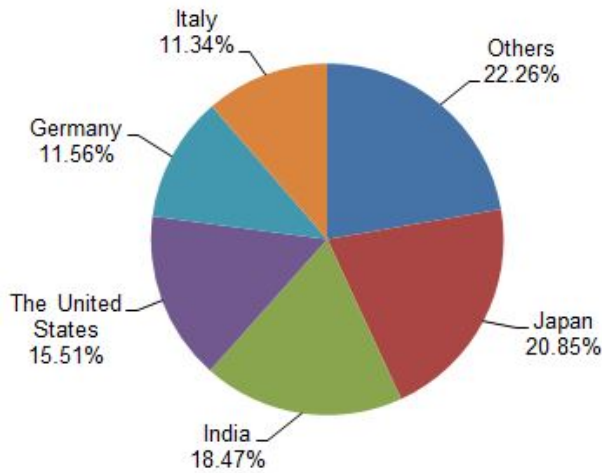
Source: China Customs & CCM

Figure 16: Imports of PTFE into China, April–Nov. 2016



Source: China Customs & CCM

Figure 17: Selected import origins of PTFE into China by volume, Nov. 2016



Source: China Customs & CCM

Price Update

Ex-works prices of major fluorochemicals in China in Dec. 2016

Table 8: Ex-works prices of major fluorochemicals in China in Dec. 2016

Product	Dec. 2016		Nov. 2016		MoM change (USD)
	USD/t	RMB/t	USD/t	RMB/t	
Fluorite (97% wet powder)	230	1,586	229	1,551	+0.44%
AHF (99.95%)	907	6,254	878	5,947	+3.30%
HCFC-22	1,326	9,144	1,312	8,887	+1.07%
HFC-134a	2,868	19,777	2,913	19,731	-1.54%
HFC-32	1,655	11,413	1,751	11,860	-5.48%
HFC-125	3,118	21,501	3,364	22,786	-7.31%
R410a	2,596	17,901	2,641	17,889	-1.70%
AIF3	991	6,834	964	6,530	+2.80%
Cryolite	850	5,861	835	5,656	+1.80%
PTFE dispersion resin	6,268	43,223	6,030	40,844	+3.95%
PTFE medium size particle resin	5,107	35,217	4,650	31,496	+9.83%

Note: Ex-works price including VAT. USD/RMB exchange rates: 6.8958 for Dec. and 6.7734 for Nov.

Source: CCM

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