

Survey of Fluorine Industry in China

The Fifth Edition

April 2018

Researched & Prepared by:

Kcomber Inc.

Copyright by Kcomber Inc.

Any publication, distribution or copying of the content in this report is prohibited.

Contents

Executive summary	1
Introduction and Methodology	3
1 Overview of fluorine industry in China	5
1.1 Fluorine industry chain	5
1.2 Current situation of fluorine industry in China	6
1.3 Affecting policy on fluorine industry in China.....	8
1.3.1 Main policies affecting China's fluorine industry after 2000	8
1.3.2 China's latest environmental policies on fluorine industry and impact analysis	9
1.3.3 Forecast on Chinese policy trend on fluorine industry	12
2 Fluorite	14
2.1 Overview of fluorite reserves in China	14
2.2 Production of fluorite in China	15
2.3 Major producers of fluorite in China.....	17
2.4 Imports and exports of fluorite in China	20
2.5 Price of fluorite in China.....	21
2.6 Forecast on supply and demand of fluorite in China	23
3 Inorganic fluoride in China	25
3.1 Anhydrous hydrogen fluoride (AHF)	25
3.2 Aluminum fluoride	37
3.3 Cryolite	43
3.4 Lithium hexafluorophosphate	47
3.5 Others	51
3.6 Development trend.....	53
4 Fluorohydrocarbon in China.....	55
4.1 Overview of fluorohydrocarbon industry in China.....	57
4.2 Production and market situation of major products	60
4.2.1 Situation of HCFC-22	60
4.2.2 Situation of HFC-134a.....	64
4.2.3 Situation of HFC-32.....	69
4.2.4 Situation of HFC-125.....	72
4.2.5 Situation of HFC-410a.....	75
4.2.6 Situation of other major products.....	78

4.2.7 Development trend.....	79
4.2.8 Forecast	81
5 Fluor polymer in China.....	83
5.1 Fluor resin	83
5.1.1 Overview of fluor resin	83
5.1.2 Production and market situation of major products	85
5.1.3 Development trend.....	98
5.2 Fluor rubber.....	99
5.2.1 Overview of fluor rubber.....	99
5.2.2 Production and market situation of fluor rubber.....	101
5.2.3 Development trend.....	104
6 Conclusion.....	104

LIST OF TABLES

Table 1.3.1-1 Main policies affecting China's fluorine industry, Jan. 2000–Aug. 2017
Table 1.3.2-1 Major fluorite producers affected by environmental protection activities in China, Sept.–Nov. 2017
Table 1.3.2-2 Major AHF producers affected by environmental protection activities in China, Sept.–Nov. 2017
Table 1.3.2-3 Major AHF production areas affected by environmental protection activities in China, Sept.–Nov. 2017
Table 1.3.3-1 China's export volume of fluorite (CaF ₂ >97%) and AHF, 2011–2016
Table 2.1-1 Key areas of recoverable fluorite reserves, 2016, million tonne
Table 2.3-1 Capacity of fluorite in China by major producer, 2014–H1 2017, t/a
Table 2.3-2 Output of fluorite in China by producer, 2014–H1 2017, tonne
Table 2.4-1 Imports and exports of fluorite (CaF ₂ >97%) in China, 2011–2016
Table 2.4-2 Imports and exports of fluorite (CaF ₂ ≤97%) in China, 2011–2016
Table 3.1-1 Capacity and output of major AHF producers in China, 2014–H1 2017
Table 3.1-2 Capacity and output of major electronic grade hydrogen fluoride producers in China, 2014–H1 2017
Table 3.1-3 Imports and exports of AHF in China, 2011–2016
Table 3.1-4 China's exports of AHF by destination, 2016
Table 3.1-5 Consumption volume and share of AHF by application field in China, H1 2017
Table 3.2-1 Capacity and output of major aluminum fluoride producers in China, 2016
Table 3.2-2 Imports and exports of China's aluminum fluoride, 2011–2016
Table 3.2-3 China's exports of aluminum fluoride by destination, 2016
Table 3.3-1 Capacity and output of major cryolite producers in China, 2016
Table 3.3-2 Imports and exports of cryolite in China, 2011–2016

Table 3.4-1 Capacity and output of major lithium hexafluorophosphate producers in China, 2016

Table 3.4-2 China's imports and exports of lithium hexafluorophosphate, 2015–2016

Table 3.5-1 Capacity and output of major potassium fluoride producers in China, 2016

Table 3.5-2 Imports and exports of China's sodium fluoride, 2011–2016

Table 3.6-1 Forecast on demand for inorganic fluoride products in China, 2017–2021

Table 4-1 Current policies of refrigerant products in the world, 2016

Table 4.1-1 Output of downstream products of refrigerants in China, 2011–2017

Table 4.2.1-1 Major producers of HCFC-22 in China, 2016

Table 4.2.1-2 China's exports of HCFC-22, 2014–2016

Table 4.2.2-1 Major producers of HFC-134a in China, 2016

Table 4.2.3-1 Major producers of HFC-32 in China, 2016

Table 4.2.4-1 Major producers of HFC-125 in China, 2016

Table 4.2.5-1 Major producers of HFC-410a in China, 2016

Table 4.2.8-1 Forecast on demand for the main fluorine refrigerants in China

Table 5.1.2-1 Capacity and output of major PTFE producers in China, 2016

Table 5.1.2-2 Imports and exports of PTFE in China, 2011–2016

Table 5.1.2-3 Capacity and output of major PVDF producers in China, 2016

Table 5.1.2-4 Imports and exports of other kinds of fluor polymers in China, 2011–2016

Table 5.1.2-5 Capacity and output of major FEP producers in China, 2016

Table 5.2.2-1 Capacity and output of major fluor rubber producers in China, 2016

LIST OF FIGURES

Figure 1.1-1 Fluorine chemical industry chain in China, 2016

Figure 2.1-1 Distribution of proven fluorite reserves in China, 2016

Figure 2.2-1 Recoverable fluorite reserves in China, 2011–2016

Figure 2.2-2 Output of fluorite in China, 2011–H1 2017

Figure 2.3-1 Distribution of Chinese major fluorite producers, H1 2017

Figure 2.5-1 Monthly ex-works price of fluorite ($\text{CaF}_2 > 97\%$) in China, Jan. 2014–Dec. 2017

Figure 2.6-1 Forecast on recoverable fluorite reserves in China, 2017–2021

Figure 2.6-2 Forecast on output of fluorite in China, 2017–2021

Figure 3.1-1 Capacity and output of AHF in China, 2011–H1 2017

Figure 3.1-2 Capacity and output of electronic grade hydrogen fluoride in China, 2011–H1 2017

Figure 3.1-3 Distribution of Chinese major AHF producers, H1 2017

Figure 3.1-4 Distribution of Chinese major electronic grade hydrogen fluoride producers, H1 2017

Figure 3.1-5 China's imports and exports of AHF, 2011–2016

Figure 3.1-6 Top 5 export destinations of China's AHF by volume, 2016

Figure 3.1-7 Monthly ex-works price of AHF (99.95%) in China, Jan. 2014–Nov. 2017

Figure 3.1-8 Apparent consumption of AHF in China, 2011–H1 2017

Figure 3.1-9 Consumption pattern of AHF in China by application field, H1 2017

Figure 3.1-10 Forecast on capacity and output of AHF in China, 2017–2021

- Figure 3.1-11 Forecast on consumption volume of AHF in China, 2017–2021
- Figure 3.2-1 Capacity and output of aluminum fluoride in China, 2011–2016
- Figure 3.2-2 China's exports of aluminum fluoride, 2011–2016
- Figure 3.2-3 Top 5 export destinations of China's aluminum fluoride by volume, 2016
- Figure 3.2-4 Monthly ex-works price of aluminum fluoride in China, Jan. 2013–Dec. 2017
- Figure 3.2-5 Apparent consumption of aluminum fluoride in China, 2011–2016
- Figure 3.3-1 Capacity and output of cryolite in China, 2011–2016
- Figure 3.3-2 Imports and exports of China's cryolite, 2011–2016
- Figure 3.3-3 Monthly ex-works price of cryolite (CH-1) in China, Jan. 2014–Dec. 2017
- Figure 3.3-4 Apparent consumption of cryolite in China, 2011–2016
- Figure 3.4-1 Capacity and output of lithium hexafluorophosphate in China, 2011–2016
- Figure 3.4-2 Monthly ex-works price of lithium hexafluorophosphate in China, Jan. 2016–Sept. 2017
- Figure 3.4-3 Apparent consumption of lithium hexafluorophosphate in China, 2015–2016
- Figure 4.1-1 Main refrigerant substitutes in China
- Figure 4.2.1-1 Capacity and output of HCFC-22 in China, 2007–2016
- Figure 4.2.1-2 Monthly ex-works price of HCFC-22 in China, Jan. 2013–Dec. 2017
- Figure 4.2.1-3 Consumption pattern of HCFC-22 in China, 2016
- Figure 4.2.2-1 Capacity and output of HFC-134a in China, 2011–2016
- Figure 4.2.2-2 Monthly ex-works price of HFC-134a in China, Jan. 2014–Dec. 2017
- Figure 4.2.2-3 Consumption pattern of HFC-134a in China, 2016
- Figure 4.2.3-1 Capacity and output of HFC-32 in China, 2014–2016
- Figure 4.2.3-2 Monthly ex-works price of HFC-32 in China, Jan. 2014–Dec. 2016
- Figure 4.2.4-1 Capacity and output of HFC-125 in China, 2014–2016
- Figure 4.2.4-2 Monthly ex-works price of HFC-125 in China, Jan. 2014–Dec. 2016
- Figure 5.1.2-1 Capacity and output of PTFE in China, 2011–2016
- Figure 5.1.2-2 Monthly ex-works price of PTFE in China, Jan. 2013–Dec. 2017
- Figure 5.1.2-3 Apparent consumption of PTFE in China, 2011–2016
- Figure 5.1.2-4 Capacity and output of PVDF in China, 2011–2016
- Figure 5.1.2-5 Monthly ex-works price of PVDF used in lithium-ion battery binder in China, Jan. 2017–Dec. 2017
- Figure 5.1.2-6 Capacity and output of FEP in China, 2011–2016
- Figure 5.1.2-7 Monthly ex-works price of FEP in China, Jan. 2017–Aug. 2017
- Figure 5.2.2-1 Capacity and output of fluor rubber in China, 2011–2016
- Figure 5.2.2-2 Output and sales volume of automobile in China, 2011–2017

1. Introduction

The report reveals the policies and environmental regulatory actions in fluorine industry and analyses their impacts on production, producers, prices and consumption of fluorine in China. The main products for this study consist of fluorite, inorganic fluoride, fluorohydrocarbon and fluor polymer.

Region scope: China

Time scope: 2011–2017

2. Approach in this report

The report is drafted by diverse methods as follows:

1. Desk research

The sources of desk research are various, including published magazines, journals, government statistics, industrial statistics, customs statistics, seminars as well as information from the internet. A lot of work has gone into the compilation and analysis of the obtained information. When necessary, checks have been made with Chinese suppliers regarding production information.

2. Telephone interviews

CCM has carried out extensive telephone interviews in order to survey the market of fluorine industry in China.

Interviewees cover the following:

- Key producers
- Key traders
- Material suppliers
- Associations
- Experts

Data processing and presentation

- The data collected and compiled are sourced from:
- CCM's database, ValoTracer
- Published articles from periodicals, magazines and journals, and third-party databases
- Statistics from governments and international institutes
- Telephone interviews with domestic producers, service suppliers, governments, etc.
- Third-party data providers
- Comments from industrial experts
- Professional databases from other sources
- Information from the internet

The data from various sources have been combined and cross-checked to make this report as precise and scientific as possible. Throughout the process, a series of internal discussions took place in order to analyse the data and draw conclusions from them.

3. Executive summary

Fluorine industry has been one of the fastest developing and most promising chemical industries in China. China has become one of the largest fluorine production and consumption areas. There are four important sectors for China's fluorine industry, consisting of inorganic fluoride, fluor-refrigerant, fluor polymer and fluor-intermediate.

China is the country that has the highest proven fluorite reserves. In 2016, it had recoverable fluorite reserves of about XXX million tonnes, next to South Africa. In 2016, the output of fluorite in the world is about XXX million tonnes, down by about XXX% year on year. China remains the largest fluorite producer with XXX million tonnes of output in 2016, accounting for more than XXX% of global total. Most of China's fluorite deposits are associated fluorite deposits, and the monomineral-fluorite deposits are relatively scarce. It is obviously that the available resources are limited.

In order to protect the fluorite resources, China has established fluorite industry access standards and carried out related policies to restrict the exploration and export of fluorite. The threshold for the entry of fluorite mining industry is getting higher and higher. With further integration of fluorite industry, small-scale manufacturers and the ones with inefficient technology are facing the situation to be eliminated. At the same time, the downstream industries of fluorine are continuously transformed and upgraded. Chinese government aims to raise the overall technical level of the industry, develop high value-added products and extend the industrial chain.

Since H2 2016, the Chinese government has paid much attention to environmental protection. In terms of the production safety risk and environmental pollution problems in the fluorine industry, China conducted frequent regulatory investigation. In particular, the fourth-round environmental inspection and the inspection of production safety from August to October 2017 cover fluorine companies across the country. Fluorite mining industry was impacted the most. Many small and medium-size fluorite enterprises were shut down. The overall operating rate of the fluorite industry enjoyed restrictions and progress of the industry consolidation has been accelerated.

As of H1 2017, there were more than XXX fluorite producers in China. More than XXX% of them are private enterprises, among which most are in a small scale. The specifications and prices of fluorite produced by these small-scale enterprises vary from each other, which causes chaos in China's fluorite market.

As the largest producer of anhydrous hydrogen fluoride (AHF) in the world, China witnessed rapid development of AHF in the past five year. But the large expansion of AHF capacity has led to the current overcapacity. In 2016, there were more than XXX AHF manufacturers in China, and the domestic capacity and output of AHF reached XXX t/a and XXX tonnes respectively. In addition, China's electronic grade hydrogen fluoride has also developed

rapidly. There are about XXX producers of electronic grade hydrogen fluoride in China, and the domestic capacity and output of electronic grade hydrogen fluoride reached XXX t/a and XXX tonnes respectively.

China is also the largest producer of aluminum fluoride and cryolite in the world. In 2016, the domestic capacity of aluminum fluoride and cryolite were XXX t/a and XXX t/a respectively. At present, both aluminum fluoride and cryolite industries suffer from overcapacity. Meanwhile, production of lithium hexafluorophosphate developed fast in the past five years and its capacity reached XXX t/a in 2016. It's expected that the growth momentum will continue with the rapid development of new energy vehicles. The capacity of potassium fluoride was XXX t/a, while that of sodium fluoride was over XXX t/a in the same year.

There were about XXX fluorine refrigerant manufacturers with a total capacity of more than XXX million t/a in China in 2015. At present, the main fluorine refrigerants in China are HCFC-22, HFC-134a, HFC-32, HFC-125 and HFC-410a. With the capacity and output of XXX t/a and XXX tonnes respectively in 2016, HCFC-22 is still a major refrigerant in China. However, due to the elimination of HCFCs according to the Montreal Protocol, the production of HCFC-22 has been restricted and its consumption as a refrigerant has been decreasing.

HFC-410a has been a substitute for HCFC-22. However, HFC-410a is not the final alternative to HCFC-22 because HFC-410a still contains fluorine atoms. Therefore, Chinese refrigerant enterprises have been actively looking for safer and more environmentally friendly refrigerants. It's estimated that more low-fluoride or even non-fluoride refrigerants will come out in the coming few years.

There are two main varieties of fluor polymer in China, including fluor resin and fluor rubber. The fluor polymer industry, especially fluor resin, is developing very quickly in China but facing many problems such as the inefficient technology and the lack of high-end products.

PTFE is the principal product of fluor resins in China, followed by FEP and PVDF. Fluor resins are widely used in coatings, sealing, architecture, electronic and other fields.

In recent years, along with the development of automobile and petrochemical industry, the fluor rubber develops rapidly with an output of XXX tonnes in 2016. However, lack of varieties and backward processing technology has constrained the development of the fluor rubber industry in China.

4. What's in this report?

Note: Key data/information in this sample page is hidden, while in the report it is not.

...

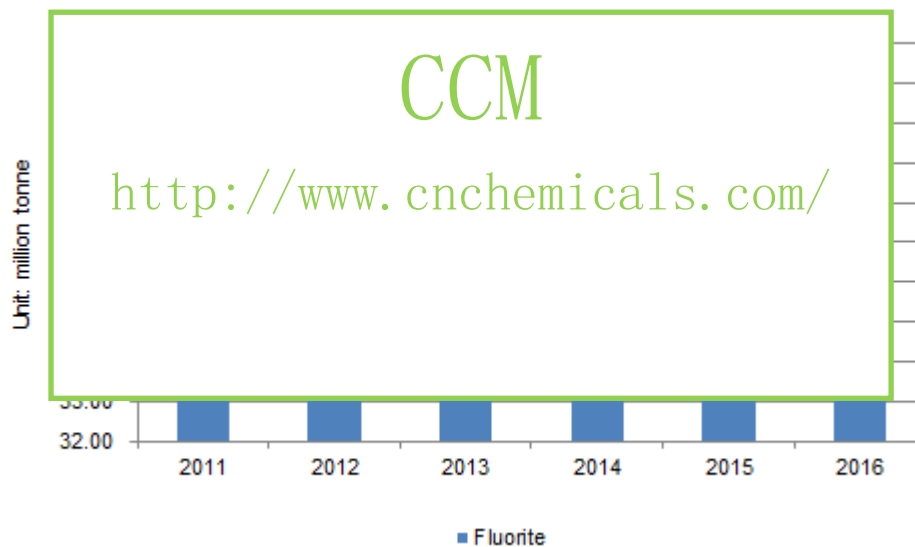
2 Fluorite

2.2 Production of fluorite in China

From 2011 to 2016, recoverable fluorite reserves in China had been increasing as a whole at a CAGR of XXX%. In 2016, the identified recoverable fluorite reserves in the country were about XXX million tonnes.

...

Figure 2.2-1 Recoverable fluorite reserves in China, 2011–2016

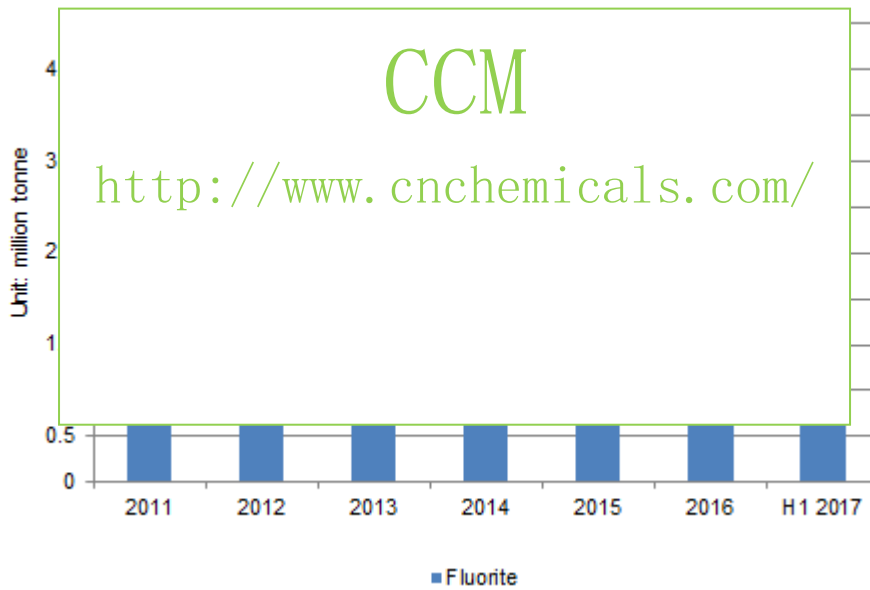


Note: The data in 2016 is estimated based on the data from USGS.

Source: National Bureau of Statistics of People's Republic of China, USGS, CCM

...

Figure 2.2-2 Output of fluorite in China, 2011–H1 2017



Note: 1. The data in H1 2017 is estimated.

2. Statistical fluorite products include high grade fluorite lump ore ($\text{CaF}_2 \geq 65\%$), metallurgical grade fluorite powder ($\text{CaF}_2 \geq 75\%$) and acid grade fluorite powder ($\text{CaF}_2 \geq 97\%$).

Source: USGS, CCM

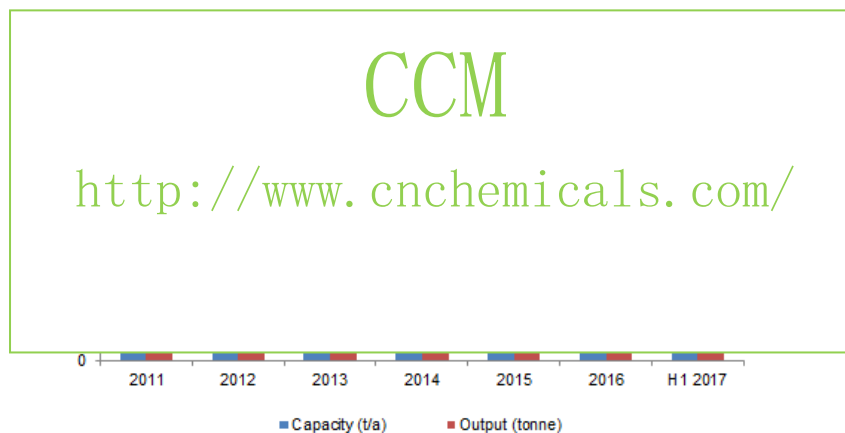
...

3 Inorganic fluoride in China

3.1 Anhydrous hydrogen fluoride (AHF)

- Production of AHF in China

Figure 3.1-1 Capacity and output of AHF in China, 2011–H1 2017



Source: CCM

www.cnchemicals.com

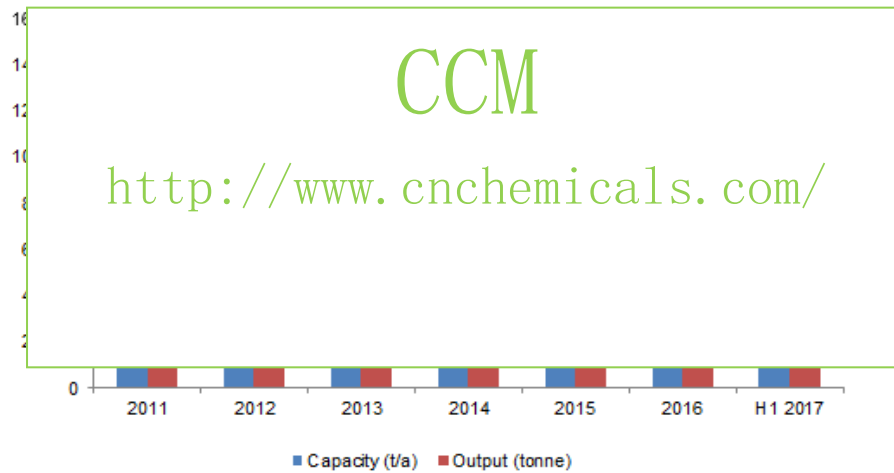
E-mail: econtact@cnchemicals.com

- Production of electronic grade hydrogen fluoride in China

...

In recent years, the domestic electronic grade hydrogen fluoride industry saw rapid development. The capacity and output of electronic grade hydrogen fluoride in China increased from XXX t/a and XXX tonnes in 2011 to XXX t/a and XXX tonnes in 2016, with CAGRs of XXX% and XXX% respectively.

Figure 3.1-2 Capacity and output of electronic grade hydrogen fluoride in China, 2011–H1 2017



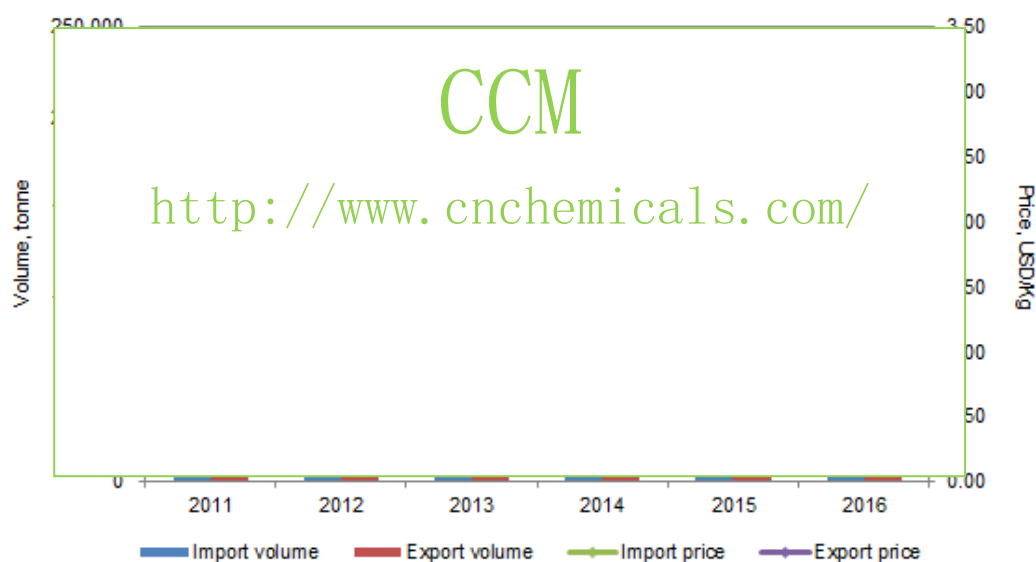
Source: CCM

...

- Imports and exports of China's AHF

...

Figure 3.1-5 China's imports and exports of AHF, 2011–2016



Source: China Customs & CCM

Table 3.1-3 Imports and exports of AHF in China, 2011–2016

Year	Import			Export		
	Volume, tonne	Value, USD	Price, USD/kg	Volume, tonne	Value, USD	Price, USD/kg
2011	XXX	XXX	XXX	XXX	XXX	XXX
2012	XXX	XXX	XXX	XXX	XXX	XXX
2013	XXX	XXX	XXX	XXX	XXX	XXX
2014	XXX	XXX	XXX	XXX	XXX	XXX
2015	XXX	XXX	XXX	XXX	XXX	XXX
2016	XXX	XXX	XXX	XXX	XXX	XXX

Source: China Customs & CCM

Table 3.1-4 China's exports of AHF by destination, 2016

No.	Destination	Export volume, tonne	Export value, USD	Export price, USD/kg
1	XXX	XXX	XXX	XXX
2	XXX	XXX	XXX	XXX
3	XXX	XXX	XXX	XXX
...	XXX	XXX	XXX	XXX
...	XXX	XXX	XXX	XXX
...	XXX	XXX	XXX	XXX
Others		XXX	XXX	XXX
Total		XXX	XXX	XXX

Source: China Customs & CCM

4.2.1 Situation of HCFC-22

- Consumption

...

Figure 4.2.1-3 Consumption pattern of HCFC-22 in China, 2016



Note: 1. New air conditioner refers to the air conditioner with HCFC-22.

2. Others include insecticides and aerosol spray.

Source: CCM

5 Fluor polymer in China

...

5.1.2 Production and market situation of major products

1) Polytetrafluoroethylene (PTFE)

...

Table 5.1.2-1 Capacity and output of major PTFE producers in China, 2016

No.	Producer	Capacity (t/a)	Output (tonne)	Operating rate
1	XXX	XXX	XXX	XXX
2	XXX	XXX	XXX	XXX
3	XXX	XXX	XXX	XXX
4	XXX	XXX	XXX	XXX
5	XXX	XXX	XXX	XXX
6	XXX	XXX	XXX	XXX
...	...	XXX	XXX	XXX
Others		XXX	XXX	XXX
Total		XXX	XXX	XXX

Source: CCM

- Imports and exports of PTFE in China

...

Table 5.1.2-2 Imports and exports of PTFE in China, 2011–2016

Year	Import			Export		
	Volume, tonne	Value, USD	Price, USD/kg	Volume, tonne	Value, USD	Price, USD/kg
2011	XXX	XXX	XXX	XXX	XXX	XXX
2012	XXX	XXX	XXX	XXX	XXX	XXX
2013	XXX	XXX	XXX	XXX	XXX	XXX
2014	XXX	XXX	XXX	XXX	XXX	XXX
2015	XXX	XXX	XXX	XXX	XXX	XXX
2016	XXX	XXX	XXX	XXX	XXX	XXX

Source: CCM & China Customs

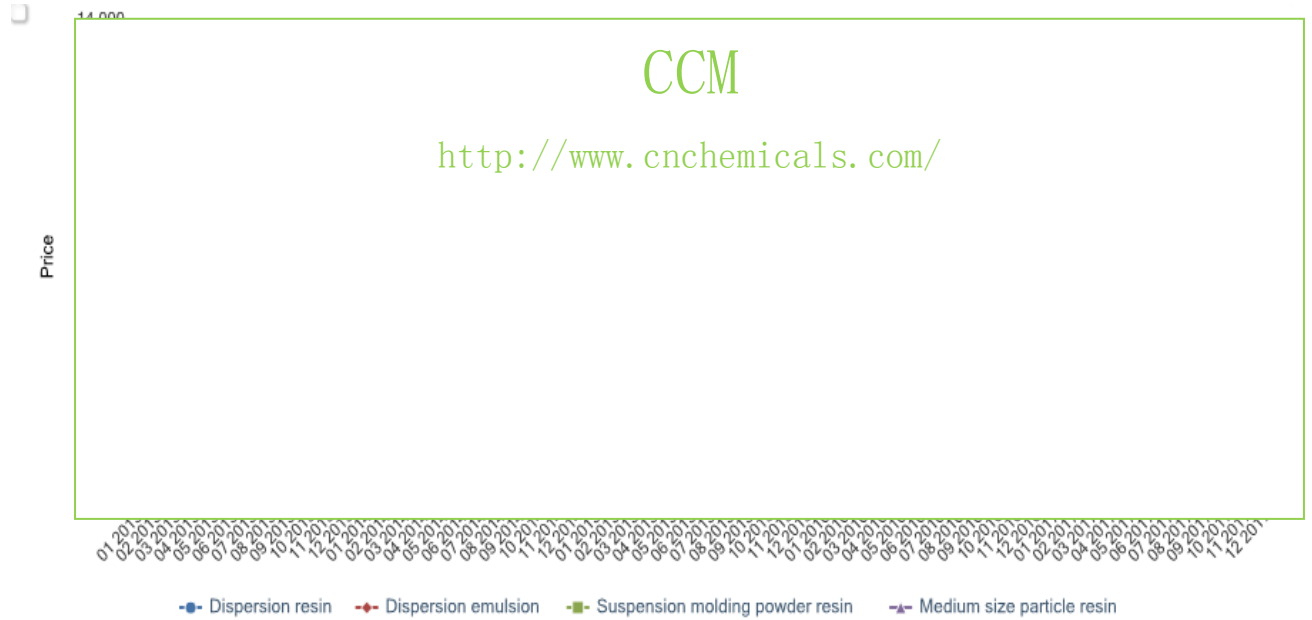
www.cnchemicals.com

E-mail: econtact@cnchemicals.com

- Price of PTFE in China

...

Figure 5.1.2-2 Monthly ex-works price of PTFE in China, Jan. 2013–Dec. 2017



Source: CCM

...

If you want more information, please feel free to contact us

Tel: +86-20-37616606 Fax: +86-20-37616968

Email: econtact@cnchemicals.com