CCM Data & Business Intelligence

Survey of Fluor Polymer in China

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Executive summary

There are two main varieties of fluor polymer in China, including fluor resin and fluor rubber. The output of fluor polymer was more than 214,000 tonnes in China in 2021. 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. Compared with foreign capital and foreign enterprises, there is still a certain gap in the product brand of fluor polymer and technology in China, showing that fluorinated enterprises still have a lot of room for development.

In China, fluor resin is widely used in coatings, sealing, architecture, electronic and other fields. There were 13 enterprises producing polytetrafluoroethylene (PTFE) in 2021, and China has become one of the most important producers of PTFE in the world. The production of PTFE accounted for more than half of the production of fluor resin in China, with a capacity of 183,800 t/a and an output of 115,800 tonnes in 2021.

Polyvinylidene fluoride (PVDF) and fluorinated ethylene propylene (FEP) industries in China have developed quickly in the past few years. The capacities of PVDF and FEP were 72,500 t/a and 39,900 t/a in 2021 respectively. There were 12 enterprises producing PVDF and 9 enterprises producing FEP in China in 2021. PVDF coating is the most important application field of PVDF, and most FEP is mainly used in communications cables and wires.

Although perfluoroalkoxy alkane (PFA) and ethylene tetrafluoroethylene (ETFE) markets are still small, these two fluor resins have already started batch production. Some products of PFA and ETFE still need to be imported, mainly from Japan and the US. PFA and ETFE are mainly used in the high-end market and have good prospects for development.

In recent years, along with the development of automobile and petrochemical industry, the fluor rubber develops rapidly with an output of 16,900 tonnes in 2021. However, the lack of varieties and backward processing technology have constrained the development of the fluor rubber industry in China.

Methodology

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, association seminars as well as information from the Internet. A lot of work is done on the compilation and analysis of the obtained information. Where necessary, checks are made with all kinds of suppliers regarding market information such as key producers, key end-users, production, consumption, export, demand and so on.

2) Telephone interviews
CCM has carried out extensive telephone interviews in order to track the actual market situation of the fluorine industry in China.
Interviewees cover:

- Major producers of fluor polymer
- Major producers of fluor rubber
- Major producers of semi-finished products
- Major producers of finished products - Major traders
- Suppliers of fluorspar, AHF, R22, HFP and VDF
- Associations

3) Network search
CCM employs a network to contact industry participants by using B2B website and software.

4) Data processing and presentation
The data collected and compiled is variously sourced from:

- CCM's database
- Published articles from periodicals, magazines, journals and third party databases
- Statistics from governments and international institutes
- Telephone interviews with domestic producers, joint ventures, service suppliers and government agencies
- Third-party data providers
- Customs statistics
- Comments from industrial experts
- Information from the Internet

The data is combined and cross-checked to ensure that this report is as accurate and methodologically sound as possible. Throughout the process, a series of discussions are held within CCM to systematically analyse the data and draw appropriate conclusions.

- Glossary

CAGR: compound annual growth rate
AHF: anhydrous hydrogen fluoride
HCFC: hydrochlorofluorocarbon
HFP: hexafluoropropylene
PTFE: polytetrafluoroethylene
FEP: fluorinated ethylene propylene
PVDF: polyvinylidene fluoride
PFA: perfluoroalkoxy alkane
ETFE: ethylene tetrafluoroethylene
PFOA: pentadecafluorooctanoic acid
PE: polyethylene
FEPM: tetrafluoro ethylene/propylene rubbers
TFE: tetrafluoroethylene
PCTFE: polytrifluorochloroethylene

- Unit

RMB: currency unit in China, also called Yuan
USD: currency unit in the US, also called US Dollar
Tonne: ton, equals to metric ton in this report
/t: per tonne
t/a: tonne per year, tonne per annual
kg: kilogram

Table 1 Exchange rate of USD/CNY, Jan. 2017–Aug. 2022

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
2017	6.8918	6.8713	6.8932	6.8845	6.8827	6.8019	6.7772	6.7148	6.5909	6.6493	6.6300	6.6067	6.7662
2018	6.5079	6.3045	6.3352	6.2764	6.3670	6.4078	6.6157	6.8293	6.8347	6.8957	6.9670	6.9431	6.6070
2019	6.8482	6.7081	6.6957	6.7193	6.7344	6.8896	6.8716	6.8938	7.0883	7.0726	7.0437	7.0262	6.8826
2020	6.9614	6.9249	6.9811	7.0771	7.0690	7.1315	7.0710	6.9980	6.8498	6.7796	6.7050	6.5921	6.9284
2021	6.5408	6.4623	6.4754	6.5584	6.4895	6.3572	6.4709	6.4660	6.4680	6.4604	6.4192	6.3693	6.4615
2022	6.3794	6.3580	6.3014	6.3509	6.5672	6.6651	6.6863	6.7467	-	-	-	-	-

Source: The People's Bank of China

1 Brief introduction to fluor polymer

The development of fluorine chemical products originated from DuPont and Minnesota Mining and Manufacturing Company (3M). In the 1950s, polytetrafluoroethylene (PTFE) and polytrifluorochloroethylene (PCTFE) were developed.

Fluor polymer is one of the main products in fluorine chemical industry, including two major categories, which are fluor resins and fluor rubbers.

Fluor resins mainly contain unmeltable PTFE and meltable homopolymer and copolymer resins, including polyvinylidene fluoride (PVDF), fluorinated ethylene propylene (FEP), perfluoroalkoxy alkane (PFA), ethylene tetrafluoroethylene (ETFE) and PCTFE.

Fluor rubbers include bibasic fluor rubbers, ternary fluor rubbers, tetrafluoro ethylene/propylene rubbers (FEPM), fluorosilicone rubbers and fluoroether rubbers. Bibasic fluor rubber is a copolymer of vinylidene fluoride (VDF) and hexafluoropropylene (HFP); ternary fluor rubber is a copolymer of VDF, tetrafluoroethylene (TFE) and HFP; FEPM is a copolymer of TFE and propylene.

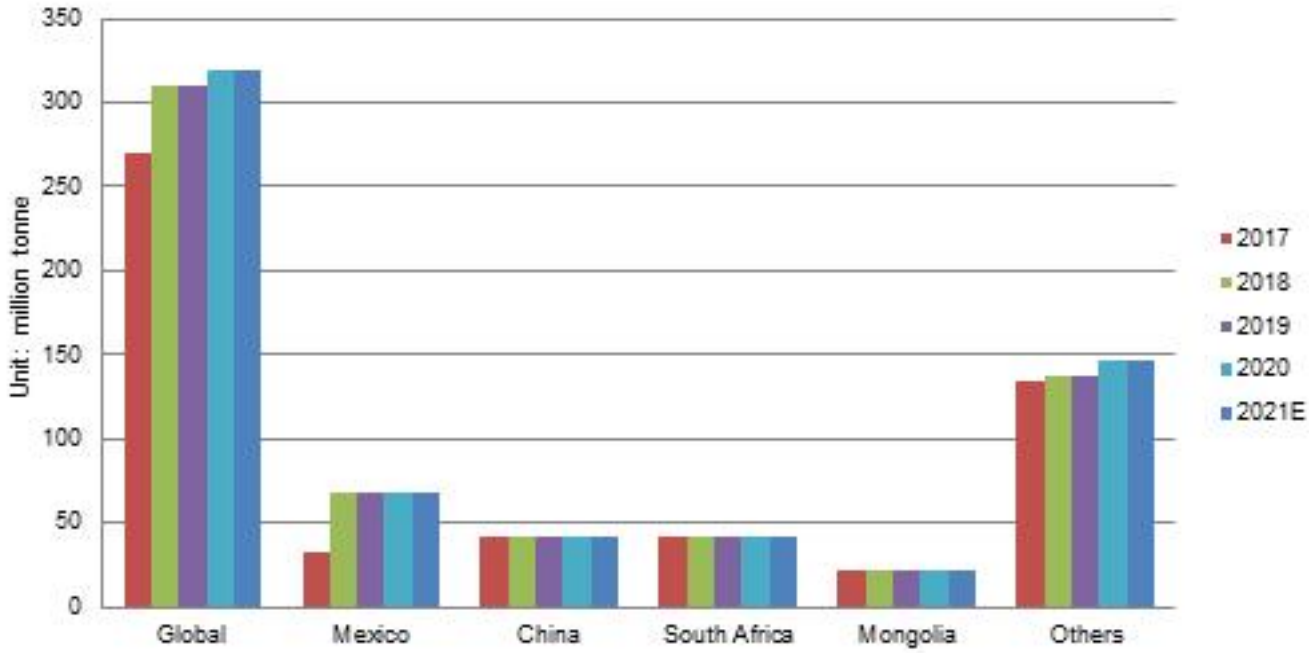
2 Raw materials

2.1 Fluorite

2.1.1 Fluorite reserves

According to statistics from the United States Geological Survey (USGS), global fluorite reserves kept increasing in 2017–2020. Till the end of 2020, there had been about 320 million tonnes of fluorite reserves worldwide. Mexico, China, and South Africa are the three countries with largest fluorite reserves, with 68 million tonnes (=21.3%), 42 million tonnes (=13.1%) and 41 million tonnes (=12.8%) respectively in 2020. Global fluorite reserves are not expected to change much in 2021.

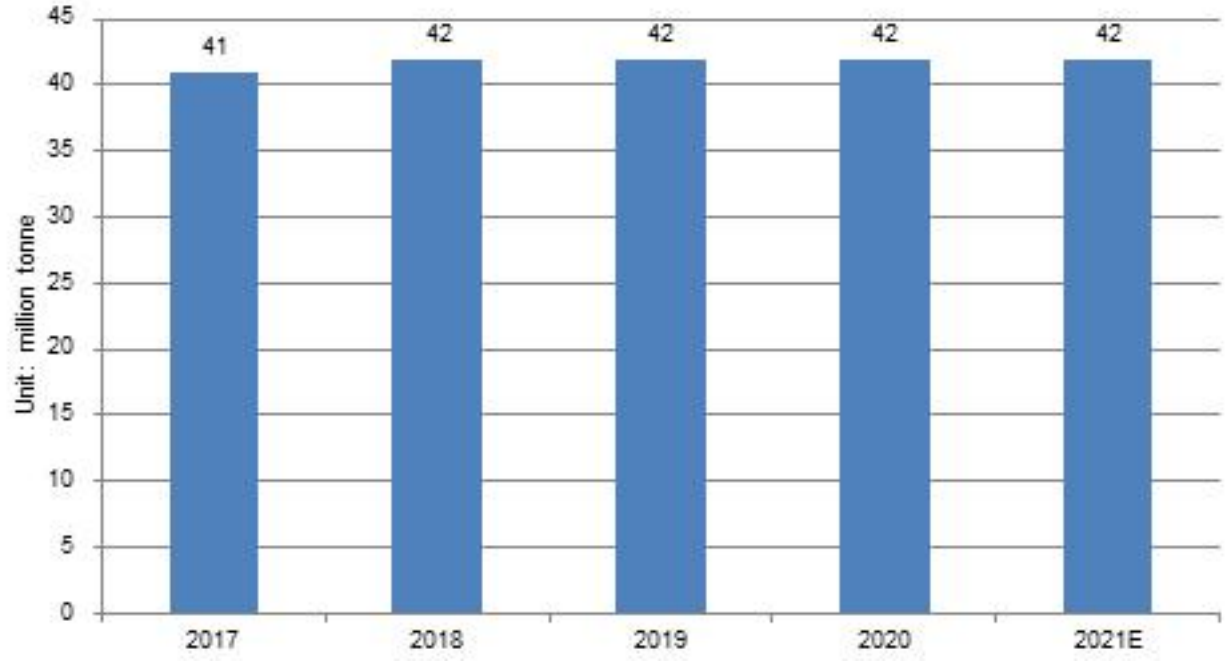
Figure 2.1.1-1 Global fluorite reserves, 2017–2021E



Note: Calculated as 100% CaF_2
Source: USGS

According to the USGS, fluorite reserves in China remained at 42 million tonnes since 2018.

Figure 2.1.1-2 Fluorite reserves in China, 2017–2021E



Note: Calculated as 100% CaF_2
Source: USGS

- Characteristics of fluorite reserves in China
  - ● Low impurity content
  - ● Less high-grade ore. The average grade of CaF_2 of a single fluorite ore is about 35%–40%, the fluorite with CaF_2 grade greater than 65% (which can be directly used as metallurgical grade lump ore) only accounts for 20% of the total single fluorite deposits, and that with CaF_2 grade greater than 80% accounts for less than 10% of the total.

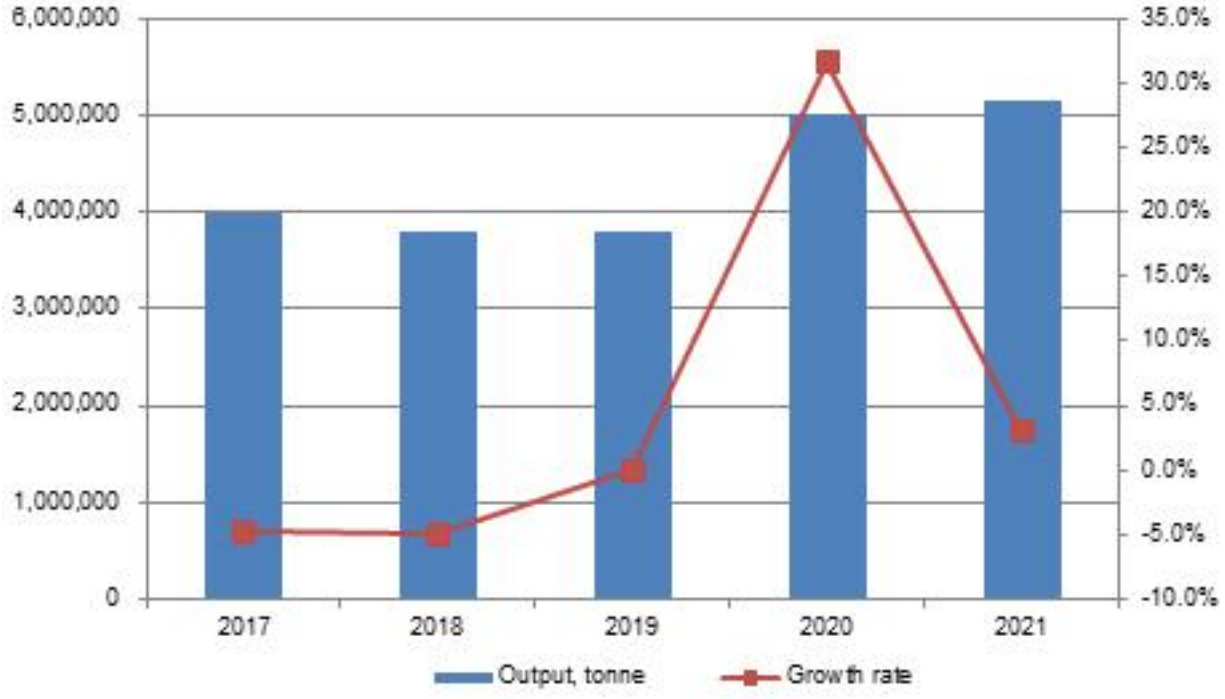
- Distribution of fluorite reserves in China
  - ● Fluorite resources in China are mainly distributed in Zhejiang Province, Jiangxi Province, Fujian Province, Hunan Province and Inner Mongolia Autonomous Region. The reserves of fluorite in these provinces account for nearly 80% of the total fluorite reserves in China.

2.1.2 Production situation

Since the end of 2016, environmental protection policies have been tightened, and some mining companies were forced to suspend production due to substandard environmental protection efforts. Among them some could not afford to invest in environmental protection equipment, and others failed to extend their mine safety production licenses (issued by the government every three years).

Strict supervision on the industry and the withdrawal of some manufacturers from the market led to a decline in the fluorite output from 4.0 million tonnes in 2017 to 3.8 million tonnes in 2019. However, the downtrend soon reversed. In 2020, driven by strong downstream demand, the output of fluorite saw great growth; in 2021, the output surpassed 5.1 million tonnes, with an increase of nearly 29% from 2017.

Figure 2.1.2-1 Fluorite production in China, 2017–2021



Note: Calculated as 100% CaF_2
Source: China Non-Metallic Minerals Industry Association & CCM

It is worth mentioning that after fast growth of fluorite production in China in the past, the governments at all levels realized that the resources should be utilized more effectively for sustainable development of fluoride industry. In 2016, China classified fluorite as one of the strategic mineral resources. With stricter execution of the policies, the position of fluorite will be further strengthened in the industry chain.

Along with the introduction of protection regulations and industry integration policies, fluorite resources will be further concentrated in medium or large enterprises, which is conducive to eliminating small and less skilled mines and companies in the industry.

In China, there are only a few large-scale and influential fluorite enterprises, which are mainly located in provinces and regions with large fluorite resources, such as Zhejiang, Jiangxi and Hunan provinces, and Inner Mongolia Autonomous Region.

Table 2.1.2-1 Main active fluorite manufacturers in China, 2020–2021

No.	Producer	Location	Capacity, t/a		Output, tonne	
			2021	2020	2021	2020
1	China Kings Resources Group Co., Ltd.	Zhejiang	1,170,000	1,170,000	472,300	415,800
2	Centralfluor Industries Group Inc.	Zhejiang	550,000	550,000	320,000	320,000
3	Yizhang Hongyuan Chemical Co., Ltd.	Hunan	510,000	510,000	330,000	350,000
4	Zhejiang Wuyi Shenlong Flotation Co., Ltd.	Zhejiang	420,000	420,000	330,000	325,000
5	Inner Mongolia Yonghe Fluorochemical Co., Ltd.	Inner Mongolia	400,000	400,000	215,500	262,500
6	Luoyang Fengrui Fluorine Co., Ltd.	Henan	400,000	400,000	126,200	120,000
7	Hunan Nonferrous Chenzhou Fluoride Chemical Co., Ltd.	Hunan	300,000	300,000	138,400	158,000
8	Chengde Yingke Fine Chemical Co., Ltd.	Hebei	290,000	290,000	220,000	238,000
9	Hunan Wanghua Fluorite Mining Co., Ltd.	Hunan	260,000	260,000	150,000	165,000
10	Zhejiang Wuyi Sanlian Industrial Development Co., Ltd.	Zhejiang	210,000	210,000	110,000	105,000
11	Luoyang Fluoride Potassium Technology Co., Ltd.	Henan	200,000	200,000	93,100	89,000
Others			2,990,000	2,590,000	2,644,500	2,451,700
Total			**7,700,000**	**7,300,000**	**5,150,000**	**5,000,000**

Note:
1. Calculated as 100% CaF_2
2. The data of some producers are estimated.
Source: CCM

2.1.3 Price

Since 2017, benefited from the recovery of the entire commodity sector and the incremental demand brought by the emerging fluorine chemical industry, the downstream demand for fluorite has been strong, and the mismatch between supply and demand has led to a surge in fluorite prices. From June to Aug., the price of fluorite ($CaF_2 > 97\%$, same below) decreased temporarily, mainly due to the decline in demand from downstream refrigerant manufacturers; As the inventory was consumed and strong demand from downstream sectors came in H2, the price rocketed rapidly from USD307/t in Sept. and reached USD450/t in April 2018.

The price trend in 2018 can be roughly divided into three stages:

- From Jan. to mid-April, domestic market price of fluorite rose slightly. Some manufacturers suspended for overhaul or reduced production, and most fluorite flotation plants in North China were shut down due to local severe cold weather, which led to a supply decline; yet demand for fluorite increased as spring is the peak season for downstream refrigerant industry.
- From late April to Sept., the price fell sharply but upped a bit quickly. Increasing supply brought the price down as the operating rate recovered in domestic fluorite enterprises with the temperature rising.
- From early Oct. to Dec., the monthly price jumped to USD499/t at last, the highest level in recent years. Main reasons for the sharp increase are as follows:
    - First, governments at multiple levels had conducted strict environmental protection investigations, so operating rates of fluorite producers reduced. In 2018, the national environmental protection team inspected fluorite enterprises in provinces and regions such as Inner Mongolia, Jiangxi, Fujian, and Zhejiang, which led to the phased shutdown of some mines and flotation units. As a result, the spot supply of fluorite tightened. Some traders held the goods and waited, also making the price of fluorite

relatively high.

○ Second, the seasonal output of fluorite in the North decreased. As temperature declined, the fluorite flotation unit in Inner Mongolia constantly stopped operation, so the supply of fluorite decreased.

○ Third, demand from downstream refrigeration industry was at a high level. Coupled with the booming new refrigerant market, it had brought some favorable support to the price of fluorite.

In 2019, subjected to the Sino-US trade conflict and weak economic growth in major global economies, the demand for fluorite from downstream industries reduced. Fluorite price fell from USD499/t, the highest in Dec. 2018, to USD414/t in Dec. 2019. Declining demand from downstream industries did affect fluorite price in 2019, yet it didn't mean that fluorite was in oversupply. In mid of harsher environmental protection regulations and frequent inspections, the price was still quite high compared with those in previous years.

In 2020, fluorite price rose in Q1 but plummeted in Q2, and then fluctuated slightly in Q3–Q4. The March price jumped to USD458/t. The supply of fluorite in the market was tight due to low operating rates of producers, but downstream manufacturers were active in purchasing, which drove the price up. As demand subsided, the price fell to USD369/t in May, and the market did not improve much all the way to the end of the year.

The price curve of fluorite in 2021 showed an "up-down-up" pattern. Specifically:

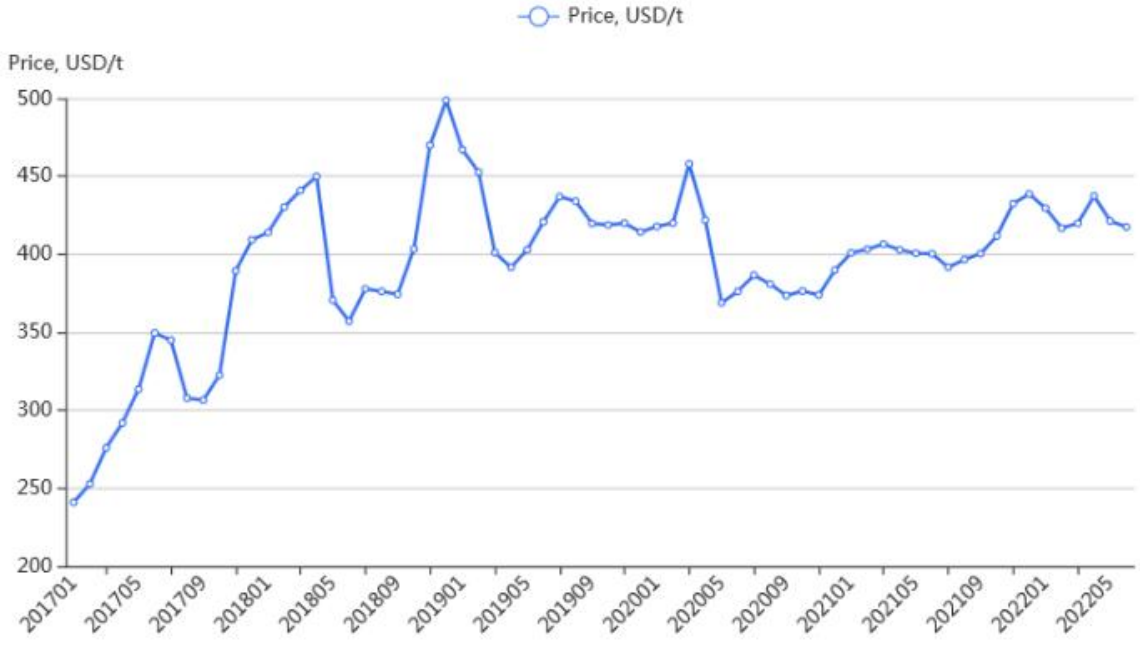
● In Jan.–March: Fluorite price rose slightly mainly because of the low operating rate affected by cold weather. Thus the supply of fluorite was insufficient.

● In April–July: Fluorite price declined a little. With many fluorite enterprises resuming production and the operating rates increasing, there was sufficient supply of fluorite, while downstream demand was still weak.

● In Aug.–Dec.: Fluorite price picked up due to declined supply in colder weather and stronger downstream demand.

In H1 2022, fluorite price fluctuated within the range of USD417/t–USD437/t.

Figure 2.1.3-1 Monthly ex-works price of fluorite (CaF_2＞97%) in China, Jan. 2017–June 2022



Source: CCM

2.1.4 Export and import

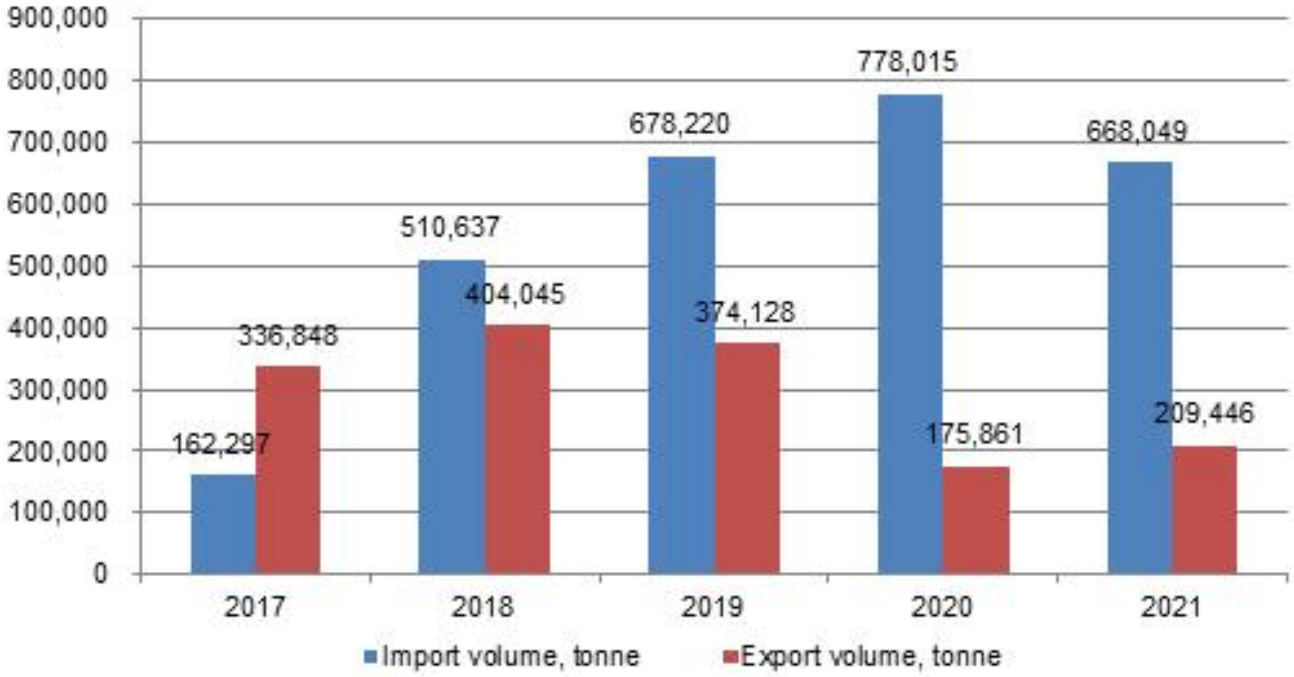
The import volume of fluorite to China kept increasing in 2017–2020, but fell back in 2021. On the contrary, the export volume decreased in 2018–2020, but rebounded in 2021.

In 2018, the import volume of fluorite reached 510,637 tonnes, exceeding the export volume for the first time.

The import volume of fluorite in China has increased sharply in the past five years mainly because:

- Limited capacity expansion and low operating rate of fluorite resulted in tight supply in the domestic market.
- Imported fluorite was cheaper.

Figure 2.1.4-1 Import and export volume of fluorite in China, 2017–2021



Note: Fluorite (CaF_2＞97%) and fluorite (CaF_2≤97%) are included.
Source: China Customs & CCM

Table 2.1.4-1 Imports and exports of fluorite (CaF_2＞97%) in China, 2017–2021

Year	Import			Export		
	Volume, tonne	Value, USD	Annual average price, USD/t	Volume, tonne	Value, USD	Annual average price, USD/t
2017	22,070	8,355,028	379	152,815	40,746,923	267
2018	90,950	27,299,068	300	201,948	80,380,612	398
2019	109,785	32,715,939	298	190,593	78,077,186	410
2020	170,313	46,655,533	274	70,702	29,890,894	423
2021	116,066	32,489,317	280	47,358	20,430,990	431

Note: CaF_2>97%: containing more than 97% calcium fluoride by weight
Source: China Customs & CCM

Table 2.1.4-2 Imports and exports of fluorite (CaF_2≤97%) in China, 2017–2021

Year	Import			Export		
	Volume, tonne	Value, USD	Annual average price, USD/t	Volume, tonne	Value, USD	Annual average price, USD/t
2017	140,228	20,552,586	147	184,032	42,321,812	230
2018	419,687	67,842,349	162	202,097	58,090,803	287

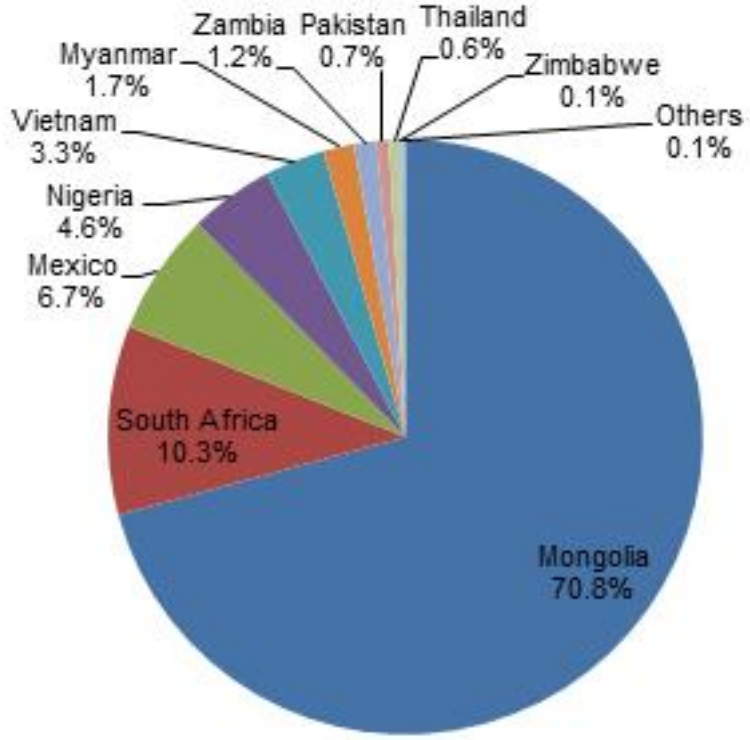
2019	568,435	87,655,452	154	183,535	56,534,300	308
2020	607,702	79,097,141	130	105,158	34,634,560	329
2021	551,983	77,888,876	141	162,088	67,154,280	414

Note: CaF_2≤97%: containing no more than 97% calcium fluoride by weight
Source: China Customs & CCM

China's fluorite imports mainly come from countries or regions with rich fluorite reserves worldwide, such as Mongolia, South Africa, Mexico, Nigeria, Vietnam, etc. In 2021, the largest import origin was Mongolia, with a volume of 472,821 tonnes, 70.8% of the total.

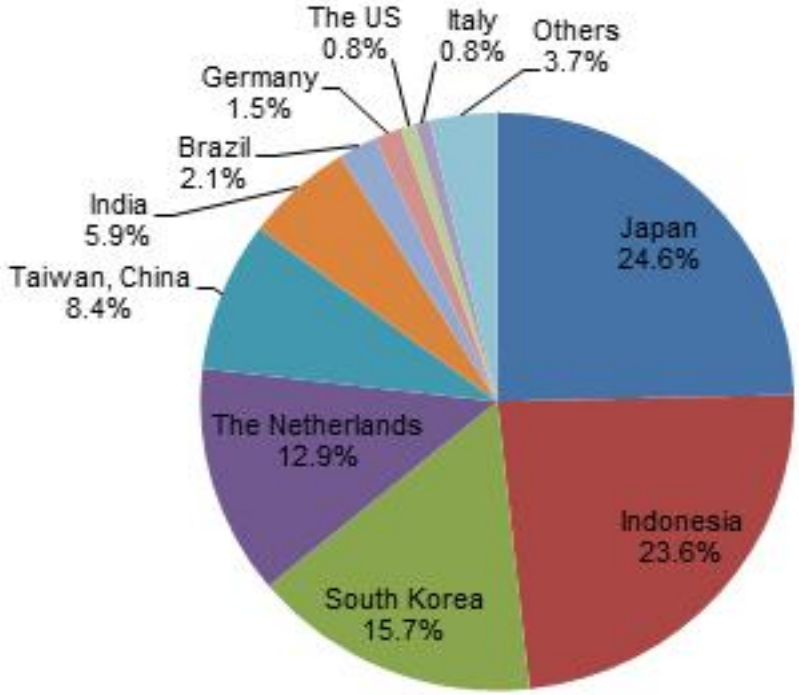
China's fluorites are mainly exported to Japan, Indonesia, South Korea and other Southeast Asian countries and regions. Among them, Japan was the largest export destination in 2021, with a volume of 51,580 tonnes, about 24.6% of the total.

Figure 2.1.4-2 Top ten fluorite import origins to China by volume, 2021



Note:
1. Fluorite (CaF_2＞97%) and fluorite (CaF_2≤97%) are included.
2. Due to rounding, the total may not equal 100.0%.
Source: China Customs & CCM

Figure 2.1.4-3 Top ten export destinations of fluorite from China by volume, 2021



Note: Fluorite (CaF_2＞97%) and fluorite (CaF_2≤97%) are included.
Source: China Customs & CCM

2.2 Anhydrous hydrogen fluoride

2.2.1 Production situation

China is the largest anhydrous hydrogen fluoride (AHF) manufacturer in the world. Domestic AHF manufacturers concentrate in Zhejiang, Fujian and Jiangxi provinces, where there are abundant fluorite resources and many downstream users of AHF.

In 2017–2021, China's AHF capacity witnessed a slight upward momentum, increasing to 2,542,000 t/a in 2021. The output also maintained an overall growth trend, except that the figure in 2020 slipped to 1,316,000 tonnes, due to delayed production resumption and thus decreased operating rate under the COVID-19 pandemic. In 2021, thanks to effectively eased COVID-19 situation at home and rising demand from downstream industries, the AHF output rebounded to 1,580,000 tonnes, up by 20.1% year on year.

Figure 2.2.1-1 Capacity and output of AHF in China, 2017–2021

Source: CCM

Table 2.2.1-1 Main active AHF manufacturers in China, 2020–2021

No.	Producer	Location	Capacity, t/a		Output, tonne	
			2021	2020	2021	2020
1	Dongyue Group Ltd.	Shandong	210,000	180,000	150,000	121,000
2	Do-Fluoride New Materials Co., Ltd. (formerly known as Do-fluoride Chemicals Co., Ltd.)	Henan	200,000	150,000	160,000	135,000
3	Zhejiang Sanmei Chemical Industry Co., Ltd.	Zhejiang	131,000	131,000	129,200	130,700
4	Zhejiang Juhua Co., Ltd.	Zhejiang	115,000	80,000	60,000	60,000
5	Qinghai Western Mining Tongxin Chemicals Co., Ltd.	Qinghai	100,000	100,000	80,000	31,000
6	Zhejiang Yonghe Refrigerant Co., Ltd.	Zhejiang	85,000	85,000	73,100	70,300
7	Shaowu Huaxin Chemical Industry Co., Ltd.	Fujian	50,000	50,000	45,000	25,000
8	Jiangsu Meilan Chemical Co., Ltd.	Jiangsu	50,000	50,000	40,000	35,000
9	Jiangxi Dongyan Pharmaceutical Co., Ltd.	Jiangxi	50,000	50,000	30,000	27,500
10	Jiangxi Shilei Fluorine Chemicals Co., Ltd.	Jiangxi	50,000	50,000	32,000	18,800
11	Hunan Nonferrous Chenzhou Fluoride Chemical Co., Ltd.	Hunan	40,000	40,000	36,000	36,000
12	Shaanxi Yanchang Petroleum Group Fluorosilicon Chemical Co., Ltd.	Shaanxi	40,000	40,000	30,000	24,000
13	Jiangxi Tianxing Chemical Co., Ltd.	Jiangxi	40,000	40,000	25,000	22,000
14	Fujian Shunchang Fubao Tengda Chemical Industry Co., Ltd.	Fujian	35,000	35,000	28,000	33,000
15	Jiangxi Chinafluorine Chemical Co., Ltd.	Jiangxi	35,000	35,000	21,000	15,800
16	Guizhou Wengfu Kailin Fluorosilicon New Material Co., Ltd.	Guizhou	30,000	30,000	25,000	25,000
17	Changshu 3F Fluorochemical Industry Co., Ltd.	Jiangsu	30,000	30,000	23,000	21,000
18	Fujian Yongfu Chemical Co., Ltd.	Fujian	30,000	30,000	21,000	10,500
19	Yantai Zhongrui Chemical Co., Ltd.	Shandong	30,000	30,000	18,000	11,600
20	Luoyang Fluoride Potassium Technology Co., Ltd.	Henan	30,000	30,000	18,000	7,500
Others			1,161,000	1,246,000	535,700	455,300
Total			**2,542,000**	**2,512,000**	**1,580,000**	**1,316,000**

Source: CCM

Capacity in most AHF producers scarcely changed in the past two years, but the capacity in leading enterprises such as Dongyue Group Ltd., Do-Fluoride New Materials Co., Ltd. and Zhejiang Juhua Co., Ltd. increased, because they need more AHF to sustain large-scale production of downstream products.

From 2020 to 2021, the share of top ten Chinese AHF producers by capacity to the national total increased,

yet the share of top ten by output to the total declined.

Table 2.2.1-2 Capacity and share of main AHF manufacturers in China, 2020–2021

Item	Capacity, 2021		Capacity, 2020	
	Volume, t/a	Share	Volume, t/a	Share
Top five	756,000	29.7%	646,000	25.7%
Top ten	1,041,000	41.0%	926,000	36.9%
Total	**2,542,000**	**/**	**2,512,000**	**/**

Source: CCM

Table 2.2.1-3 Output and share of main AHF manufacturers in China, 2020–2021

Item	Output, 2021		Output, 2020	
	Volume, tonne	Share	Volume, tonne	Share
Top five	592,300	37.5%	517,000	39.3%
Top ten	805,300	51.0%	679,500	51.6%
Total	**1,580,000**	**/**	**1,316,000**	**/**

Source: CCM

2.2.2 Price

In H1 2017, the ex-works price of AHF (99.95%) rose sharply from USD1,073/t to USD1,736/t, up by 61.7%. The main reasons for that are as follow:

- The price of fluorite, the key raw material of AHF, rose greatly.
- There was a short supply of AHF due to environmental protection pressures, routine maintenance and other factors which resulted in a low operating rate.
- The demand for AHF for the production of downstream refrigerants (like R22) increased greatly.

After a short time of adjustment in July–Aug. 2017, the price went up again and rocketed to USD2,371/t in March 2018, the highest price in the past six years. The shortage of fluorite was the main reason for this round of surge.

In 2019, the price fluctuated between USD1,349/t and USD1,868/t. It was deeply affected by the Sino-US trade dispute. With news on the phase-one trade deal between the two countries coming, the price finally stabilized at around USD1,400/t in Q4. In general, the AHF price trend in 2019 can be divided into four stages:

- From Jan. to early April: AHF market price fell sharply. Three things contributed to the decline. The first is the restart of the AHF devices after maintenance. The supply of AHF was sufficient in the market and the price decreased. Meanwhile, operating rate of upstream raw material fluorite rose slightly, especially in Inner Mongolia and Hebei. On the whole, the supply of fluorite increased, and the falling price of fluorite dragged down AHF price significantly. In addition, declining market conditions in downstream refrigerant market also affected the price.
- From mid-April to mid-July: The price rebounded. During this period, operating rate of domestic refrigerant industry rose slightly. Demand for AHF from the refrigerant sector increased, so the AHF price rebounded. On the other hand, supply of fluorite was slightly tight. The price of fluorite went up, which strongly supported AHF price.
- From late July to mid-Nov.: The price of AHF fluctuated a bit. The operating rate of AHF was about 60%. Spot AHF was sufficient while downstream refrigerant production was at a low level. Demand for upstream fluorite and AHF was poor. Specifically, operating rate of refrigerant R22 was around 50%. The operating rate of R134a remained low. Market demand for refrigerants was moderate and mainly for export.

● From the end of Nov. to the end of the year: AHF price rose slightly. Fluorite mining and flotation operated normally. As automotive industry was active in stocking, the supply of R22 was tight.

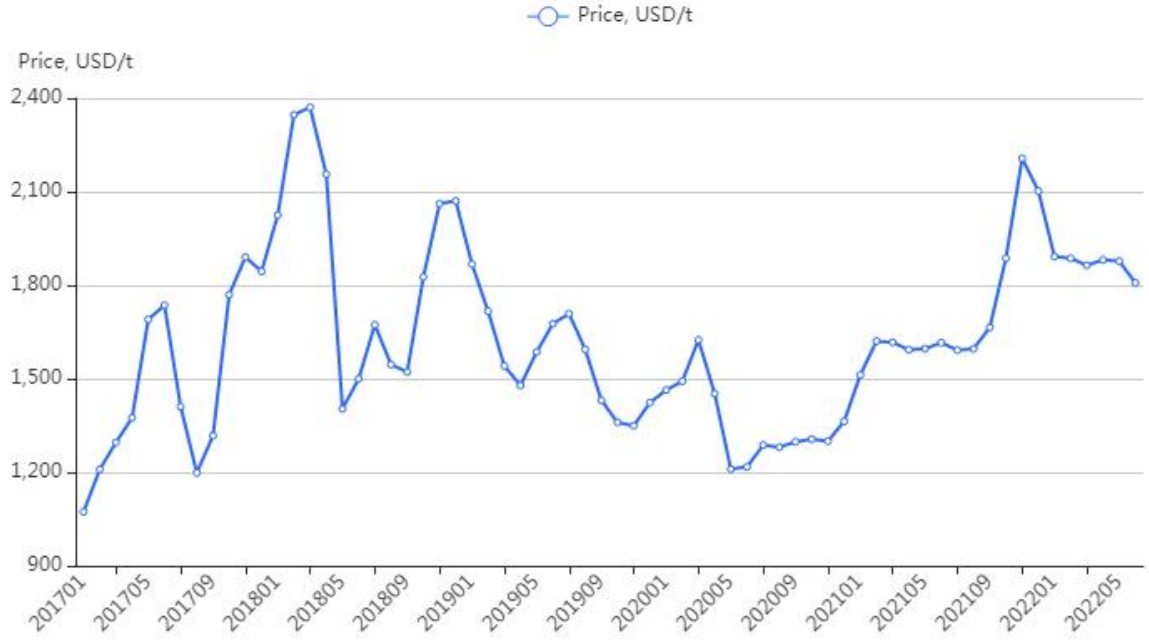
In H1 2020, the price first climbed to USD1,625/t in March, but dropped to USD1,210/t in May. The price rise in Q1 was mainly influenced by the COVID-19, as raw material supply was tight then due to impeded production, restricted transportation, as well as lack of available human resources. The AHF price followed the rising trend shown in prices of the raw materials. As domestic condition eased, production gradually resumed and AHF supply recovered, so the price began to fall. In H2 2020, the price stayed at a low level and rebounded within a narrow range, reaching USD1,363/t in Dec. 2020. The price was affected by sluggish downstream demand, especially a weak demand from refrigerant industry.

In 2021, AHF price started from USD1,512/t in Jan. and climbed to USD2,103/t in Dec., up by 39.1%. Specifically:

● In Jan.–Feb.: AHF price increased, driven by a mismatch between supply and demand and the increasing price of raw material fluorite.
● In March–Aug.: AHF price fluctuated slightly, influenced either by cost or by demand.
● In Sept.–Dec.: The rose rapidly, and peaked at USD2,207/t in Nov., mainly because prices of both the upstream material fluorite and downstream refrigerants rose.

In H1 2022, AHF price followed a downward trend, but it was still at a high level, above USD1,800/t, supported by costs.

Figure 2.2.2-1 Monthly ex-works price of AHF in China, Jan. 2017–June 2022

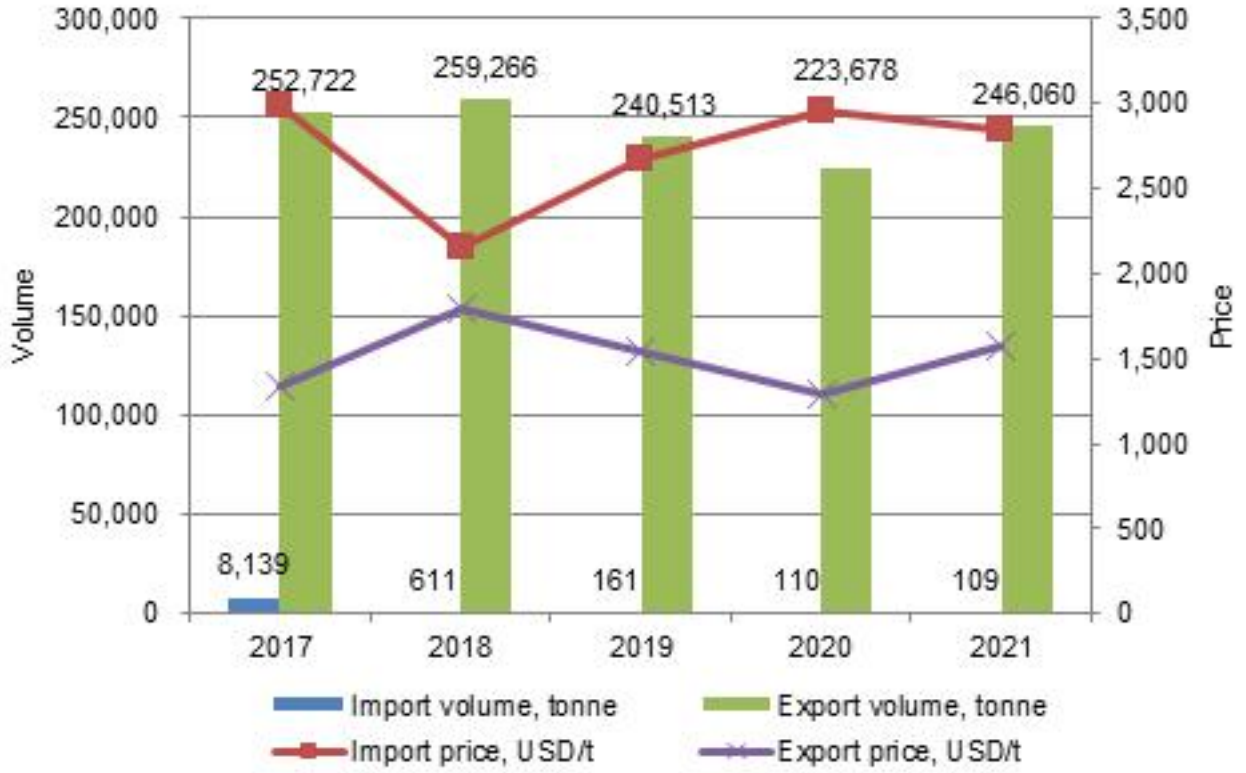


Source: CCM

2.2.3 Import and export

China AHF import is quite small. As to AHF export, the volume fluctuated in 2017–2021. The export volume increased to 259,266 tonnes in 2018, the highest in the past five years. It kept decreasing in 2019 and 2020, but recovered to 246,060 tonnes in 2021 as overseas demand for AHF improved.

Figure 2.2.3-1 Import and export of AHF in China, 2017–2021



Source: China Customs & CCM

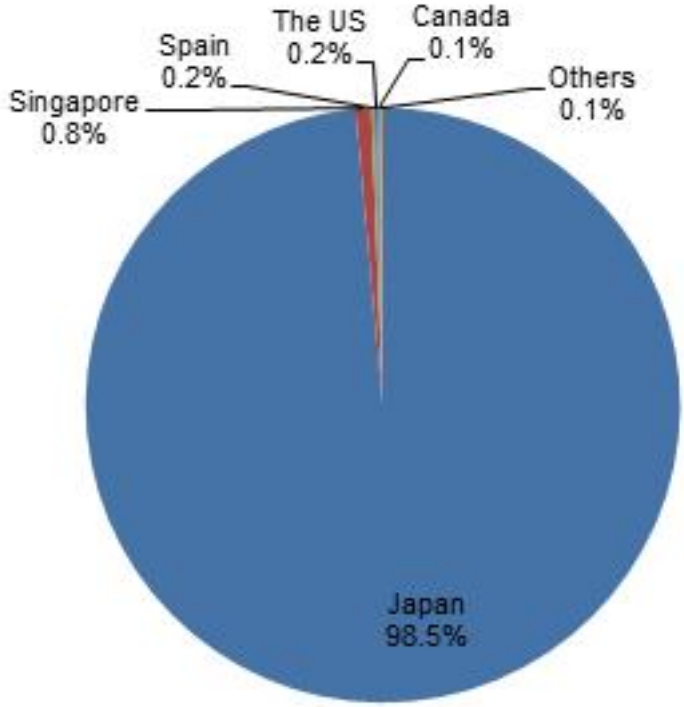
Table 2.2.3-1 Imports and exports of AHF in China, 2017–2021

Year	Import			Export		
	Volume, tonne	Value, USD	Price, USD/t	Volume, tonne	Value, USD	Price, USD/t
2017	8,139	24,328,750	2,989	252,722	338,330,085	1,339
2018	611	1,316,003	2,155	259,266	463,492,030	1,788
2019	161	429,883	2,666	240,513	369,441,548	1,536
2020	110	325,255	2,957	223,678	288,553,356	1,290
2021	109	309,241	2,847	246,060	388,422,726	1,579

Source: China Customs & CCM

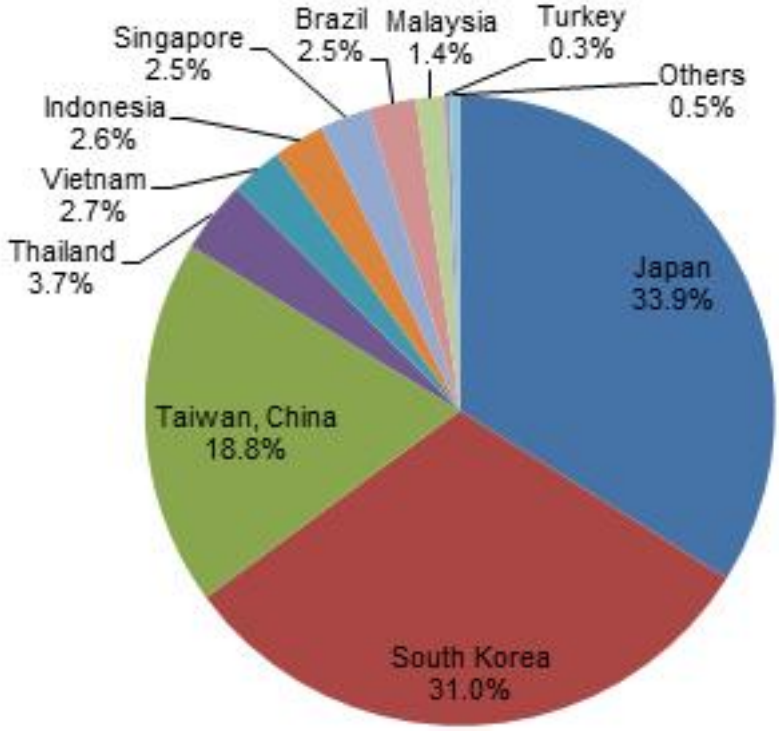
China mainly exports AHF to Asian countries and regions. In 2021, Japan was the largest export destination of China's AHF by volume, followed by South Korea, Taiwan Province, Thailand and Vietnam. Japan was also the largest import origin of AHF to China the same year, the volume making up 98.5% of total import volume.

Figure 2.2.3-2 Top import origins of AHF to China by volume, 2021



Note: Due to rounding, the total may not equal 100.0%.
Source: China Customs & CCM

Figure 2.2.3-3 Top ten export destinations of AHF from China by volume, 2021



Note: Due to rounding, the total may not equal 100.0%.
Source: China Customs & CCM

2.3 R22

2.3.1 Production situation

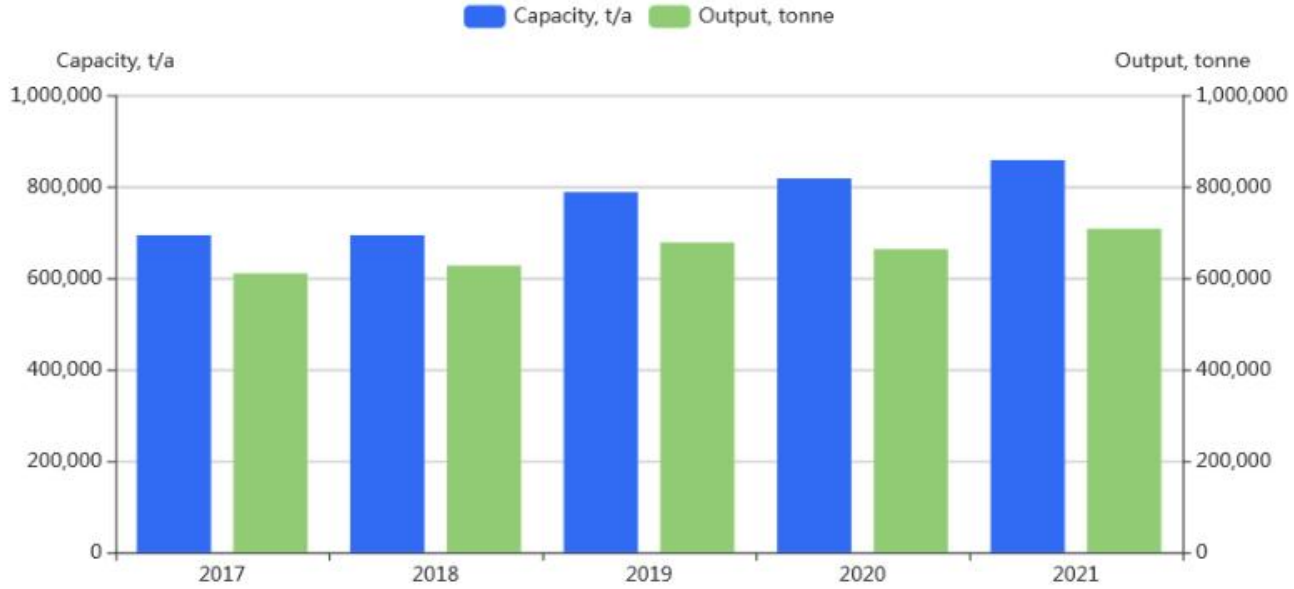
R22 is one of the major fluorine refrigerants in China.

Although the production quota of R22 as refrigerant is reduced, the production of R22 used as a raw material is not restricted. Therefore, the reduction of R22 in ODS use can be offset by the increase in raw material

use. In China, both the capacity and output of R22 used in raw material field have been on the rise with the capacity expansion of products such as PTFE and HFP.

The capacity of R22 continued to go upwards, to 857,900 t/a in 2021 from 693,900 t/a in 2017, with a CAGR of 5.4% in this period. As for output, from 2017 to 2019, the output of R22 grew along with increasing domestic demand in non-ODS field. However, influenced by the COVID-19 in 2020, the output of R22 shrank by 2.2% from the year before. As China's economy recovered in 2021, increasing domestic demand pushed up R22 output.

Figure 2.3.1-1 Capacity and output of R22 in China, 2017–2021



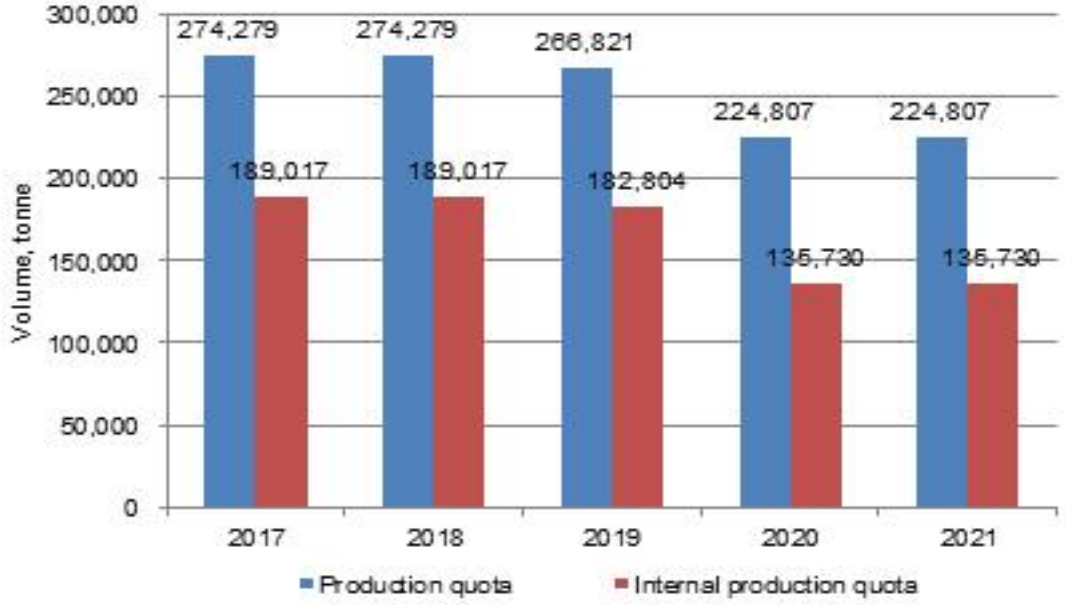
Note:
1. The data of capacity and output in 2017–2019 has been revised.
2. The capacity and output include those R22 used in non-ODS field.
Source: MEE & CCM

China has signed all agreements to the Montreal Protocol. Under the protocol, China implements quota management of the production and consumption of R22 used in ODS field. For one thing, China strictly restricts new capacity increase. For another, the sales volume could not exceed the production quota; the sales volume to domestic enterprises could not exceed the internal production quota.

Under the Montreal Protocol, China agreed to keep the production and consumption of R22 at the average level in 2009–2010 by 2013, and reduce about 10% by 2015, 35% by 2020, 67.5% by 2025 and 97.5% by 2035, all based on 2013 level. So it is expected the supply of R22 for the ODS field will be tight in the future.

A decline is witnessed in the production quota of R22 given out by the Ministry of Ecology and Environment of the People's Republic of China (MEE), from 274,279 tonnes in 2017 to 224,807 tonnes in 2021, at a CAGR of -4.9%.

Figure 2.3.1-2 Production quota of R22 in China, 2017–2021



Note: The internal production quota is part of production quota, which defines the maximum sales volume to other domestic enterprises.
Source: MEE

In China, the capacity and output of R22 are mainly concentrated in three large producers, namely Shandong Dongyue Chemical Co., Ltd., Zhejiang Juhua Co., Ltd. and Meilan Chemical Group Co., Ltd. Their R22 capacity and output combined accounted for about 60.0% and 61.9% of China's totals respectively in 2021.

In particular, Dongyue Group Ltd. is the largest R22 producer in China, with capacity and output of 220,000 t/a and 190,000 tonnes respectively in 2021. The company, having formed a complete fluorine industrial chain, is capable of not only self-supporting some raw materials for R22 like hydrogen fluoride and chloroform, but also participating in PTFE manufacturing with self-provided R22.

Table 2.3.1-1 Active R22 manufacturers in China, 2020–2021

No.	Producer	Location	2020				2021			
			Capacity, t/a	Output, tonne	Production quota, tonne	Internal production quota, tonne	Capacity, t/a	Output, tonne	Production quota, tonne	Internal production quota, tonne
1	Dongyue Group Ltd.	Shandong	220,000	180,000	66,228	37,670	220,000	190,000	66,228	37,670
2	Zhejiang Juhua Co., Ltd.	Zhejiang	183,000	148,600	58,682	42,457	183,000	152,500	58,682	42,457
3	Meilan Chemical Group Co., Ltd.	Jiangsu	112,000	92,000	46,484	33,327	112,000	95,200	46,484	33,327
4	Zhejiang Yonghe Refrigerant Co., Ltd.	Zhejiang	55,000	42,400	4,856	3,661	55,000	44,000	4,856	3,661
5	Fujian Sannong New Materials Co., Ltd.	Fujian	48,000	33,000	/	/	48,000	41,300	/	/
6	Changshu 3F Zhonghao New Chemical Materials Co., Ltd.	Jiangsu	40,000	36,700	10,660	4,916	40,000	39,000	10,660	4,916
7	Zhonghao Chenguang Research Institute of Chemical Industry Co., Ltd.	Sichuan	38,000	35,000	0	0	38,000	36,500	0	0
8	Arkema (Changshu) Fluorochemical Co., Ltd.	Jiangsu	35,000	32,500	13,245	1,051	35,000	35,000	13,245	1,051
9	Linhai Limin Chemicals Co., Ltd.	Zhejiang	32,500	20,000	10,158	4,980	32,500	23,000	10,158	4,980
10	Jiangxi Lee & Man Chemical Co., Ltd.	Jiangxi	20,000	18,000	/	/	60,000	25,000	/	/
11	Zhejiang Sanmei Chemical Co., Ltd.	Zhejiang	14,400	14,200	12,833	6,523	14,400	14,000	12,833	6,523
12	Zhejiang Pengyou Chemical Co., Ltd.	Zhejiang	10,000	9,000	1,661	1,145	10,000	9,900	1,661	1,145
13	Jiangxi Zhongfu Chemical Material Technology Co., Ltd.	Jiangxi	10,000	1,700	/	/	10,000	2,100	/	/
Total			**817,900**	**663,100**	**224,807**	**135,730**	**857,900**	**707,500**	**224,807**	**135,730**

Note:
1. The data of Zhejiang Juhua Co., Ltd., Zhejiang Sanmei Chemical Co., Ltd. and Zhejiang Yonghe Refrigerant Co., Ltd. include its subsidiaries. 2. Including those R22 used in non-ODS field.
Source: MEE & CCM

2.3.2 Price

In Jan. 2017–Nov. 2018, the ex-works price rocketed to USD3,395/t from USD1,433/t. Here are the reasons:

- Rigorous environmental inspections throughout China forced many small- or medium-sized companies to suspend production. Consequently, the remaining large refrigerant manufacturers had the upper hand and quoted higher prices.
- Great efforts were taken to avoid pollution of hydrofluoric acid and hydrochloric acid, driving up production cost.
- The strong demand from the air conditioner market also boosted the price.

In 2019, R22 price edged down, mainly due to weak support of raw materials and sluggish downstream demand.

In 2020, the price of R22 slightly fluctuated, owing to the significant reduction of production quota and the continuous outbreak of COVID-19 at home and abroad. Specifically:

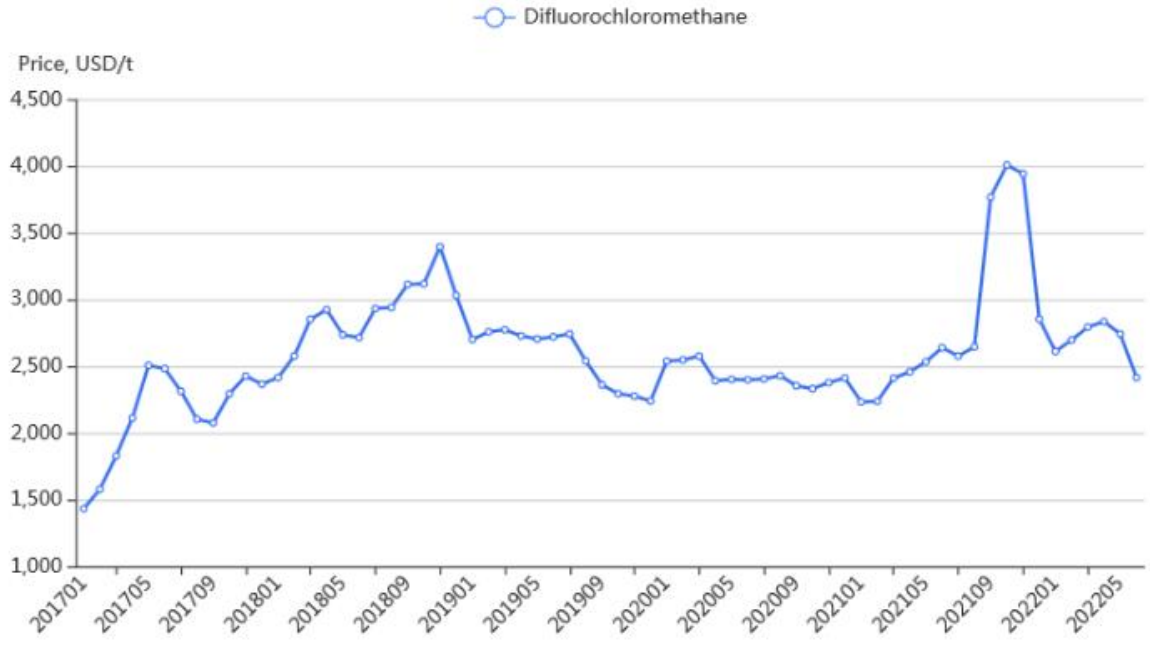
- In Q1, the price remained stable after rising, as the prices of raw material AHF and chloroform were quite stable. At the same time, affected by the COVID-19 outbreak, production resumption was delayed, and transportation control was severe. As a result, the market supply was tight, supporting the price of R22.
- In Q2, R22 price dropped, affected by the decline in raw material AHF price and weak demand home and abroad.
- In Q3–Q4, prices fluctuated slightly with changes in demand.

In 2021, R22 price went up wildly in general.

- In Q1, the price was at a low level. It edged up in March, driven by the high production cost and growing demand.
- In Q2, the price continued to rise, as the price of its raw material chloroform remained high.
- In Q3, it shot up in Sept. Two reasons led to the big increase. On the one hand, chloroform price soared, forming a strong support for R22. On the other hand, the market supply was tight, due to the impact of production quota. Thus, R22 producers or dealers were reluctant to sell.
- In Q4, it fell in Dec. from the high levels in Oct. and Nov., affected by reduced demand and weak cost support.

In H1 2022, R22 price rose in a narrow range before falling back. The price peaked in April, as supply shrank because of blocked transportation in some provinces due to COVID-19 resurgence. Then the price went down with raw material prices.

Figure 2.3.2-1 Ex-works price of R22 in China, Jan. 2017–June 2022

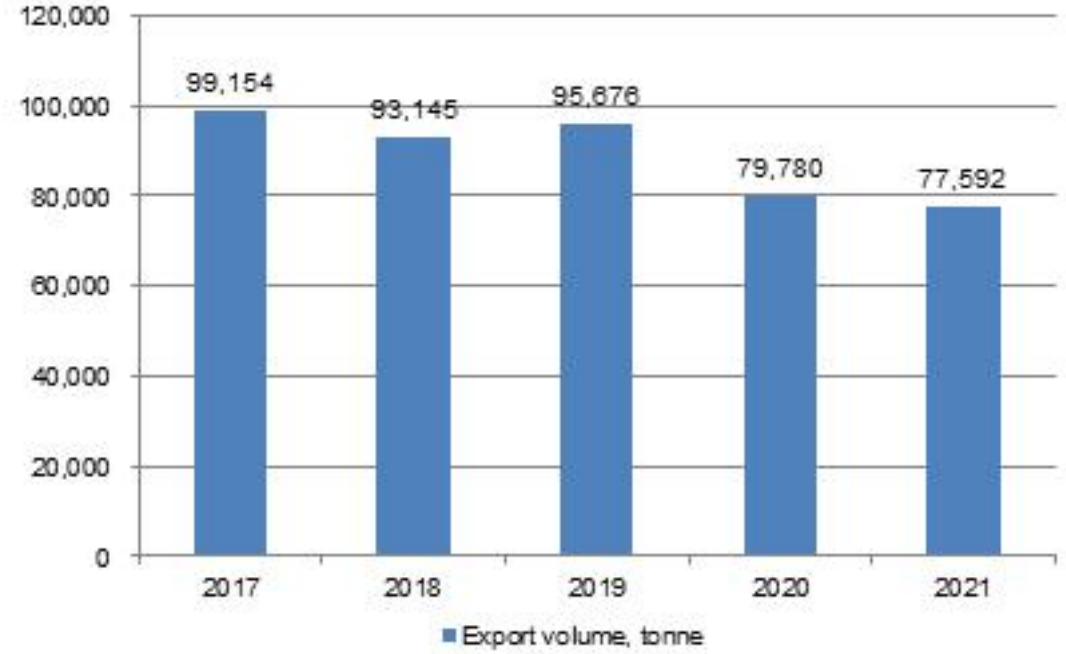


Source: CCM

2.3.3 Export

In 2017–2021, China R22 export volume fluctuated, but it showed a downward trend in general, falling from 99,154 tonnes in 2017 to 77,592 tonnes in 2021.

Figure 2.3.3-1 Export volume of R22 in China, 2017–2021



Note: The data of 2018 has been revised.
Source: China Customs & CCM

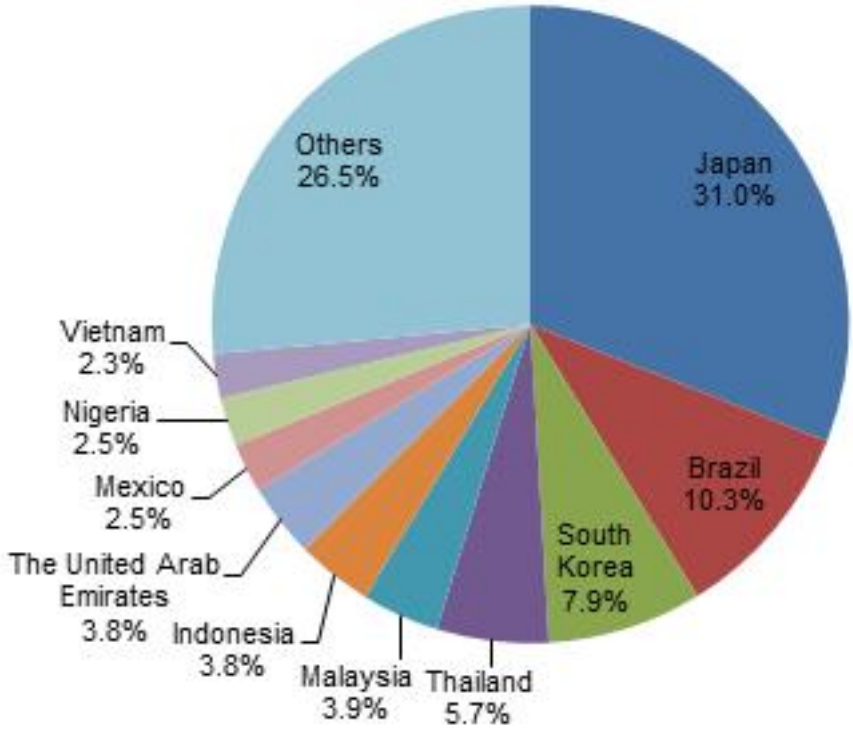
Table 2.3.3-1 Exports of R22 in China, 2017–2021

Year	Export volume, tonne	Export value, USD	Export price, USD/t
2017	99,154	182,755,217	1,843
2018	93,145	233,785,964	2,510
2019	95,676	207,045,761	2,164
2020	79,780	125,362,839	1,571
2021	77,592	173,264,882	2,233

Source: China Customs & CCM

In 2021, Japan, Brazil, South Korea and Thailand were the top four export destinations of R22 from China by volume, with combined export volume of 42,485 tonnes, about 54.9% of the total export volume.

Figure 2.3.3-2 Top ten export destinations of R22 from China by volume, 2021



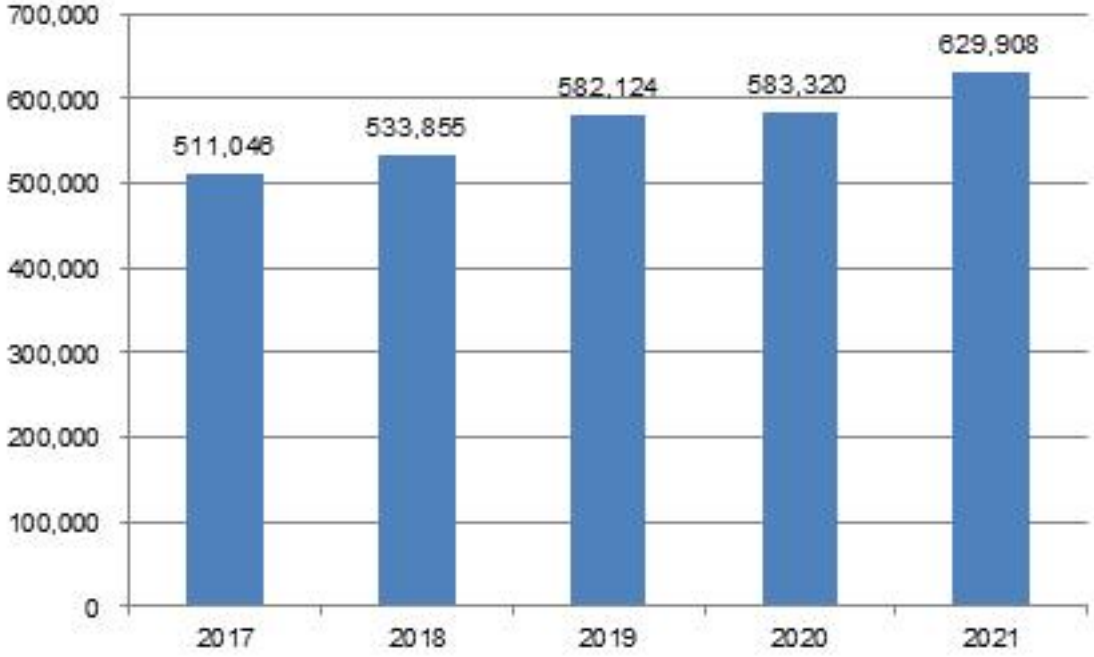
Source: China Customs & CCM

2.3.4 Consumption

R22 is the most widely used low-temperature refrigerant in China, mainly used as air conditioner refrigerant. It is also used in producing non-ODS products such as tetrafluoroethylene (TFE). TFE is an important raw material for R125, polytetrafluoroethylene (PTFE) and HFP and so on.

In China, the apparent consumption volume of R22 was on the rise in 2017–2021. The consumption increase was attributed mainly to a rising downstream demand.

Figure 2.3.4-1 Apparent consumption of R22 in China, 2017–2021



Source: CCM

Since it has been planned to phase out R22 as an air conditioning refrigerant, its application narrowed rapidly during 2017–2021; its consumption volume in air conditioning refrigerant kept dropping. But its

consumption in non-ODS sector witnessed a surge during the same period, thanks to high demand from the downstream sectors such as PTFE and HFP, boosting the total consumption of R22.

Table 2.3.4-1 Consumption of R22 in non-ODS field in China, 2017–2021

Year	Consumption volume, tonne
2017	322,029
2018	344,838
2019	399,320
2020	447,590
2021	494,178

Source: CCM

Table 2.3.4-2 Consumption quota of R22 in ODS field in China, 2017–2021

Year	Consumption quota, tonne			
	Room air conditioner	Industrial and commercial refrigeration and air conditioning	Extrude polystyrene foam	Others
2017	58,154	8,542	3,852	118,469
2018	47,501	7,870	2,002	131,644
2019	48,941	7,425	1,278	125,160
2020	35,215	5,885	1,419	93,211
2021	31,726	5,959	1,175	96,870

Source: MEE & CCM

Table 2.3.4-3 R22 quota allocation for room air conditioner industry, 2021

Company	Use quota, tonne	Percentage
Gree Group	11,452	36.1%
Media Group	8,050	25.4%
Zhigao Group	2,797	8.8%
TCL Group	2,251	7.1%
Haier Group	2,062	6.5%
AUX Group	1,300	4.1%
Galanz Group	1,200	3.8%
Haixin Group	1,000	3.2%
Others	1,614	5.1%
Total	**31,726**	/

Source: MEE

Table 2.3.4-4 R22 quota allocation for refrigeration and air conditioning in industrial and commercial application, 2021

Company	Use quota, tonne	Percentage
Gree Group	2,334	39.2%
Media Group	1,990	33.4%
Haier Group	777	13.0%
Others	858	14.4%
Total	**5,959**	/

Source: MEE

2.4 VDF

Vinylidene fluoride (VDF) is mainly used to produce polyvinylidene fluoride (PVDF) and fluor rubbers. In China, most PVDF and fluoro rubber manufacturers are equipped with VDF production plant to produce it for self-use; usually little is for sale.

As the reactive monomer of PVDF and fluor rubbers, VDF capacity expansion is decided by the demand for VDF. Overall, downstream sectors have strong demand for PVDF and fluor rubbers, especially for PVDF. Thus, the demand for VDF will continue to increase. Good development prospects will attract potential entrants into the industry in the future.

In 2021, there were 14 VDF manufacturers in China with the total capacity and output reaching 103,800 t/a and 74,300 tonnes respectively. In 2021, thanks to surging downstream demand, operating rates of most VDF enterprises were at a high level.

Table 2.4-1 Manufacturers of VDF in China, 2021

No.	Producer	Location	Capacity, t/a	Output, tonne
1	Shandong Huaxia Shenzhou New Material Co., Ltd.	Shandong	18,000	15,700
2	Arkema (Changshu) Fluorochemical Co., Ltd.	Jiangsu	12,000	9,100
3	Inner Mongolia 3F Wanhao Fluorochemical Co., Ltd.	Inner Mongolia	12,000	7,800
4	Solvay Specialty Polymers (Changshu) Co., Ltd.	Jiangsu	10,000	6,500
5	Shandong Hua'an New Material Co., Ltd.	Shandong	8,600	800
6	Zhejiang Fluorine Chemical New Material Co., Ltd.	Zhejiang	8,000	6,700
7	Changshu 3F Zhenfu New Materials Co., Ltd.	Jiangsu	6,000	5,100
8	Shandong Deyi New Material Co., Ltd.	Shandong	6,000	3,800
9	Daikin Fluorochemicals (China) Co., Ltd.	Jiangsu	5,000	4,300
10	Ruyuan Dongyangguang Fluorine Resin Co., Ltd.	Guangdong	5,000	3,900
11	Zhejiang Juhua Co., Ltd.	Zhejiang	5,000	3,900

12	Zhonghao Chenguang Research Institute of Chemical Industry Co., Ltd.	Sichuan	3,500	3,000
13	Sinochem Lantian Fluoro Materials Co., Ltd.	Zhejiang	3,200	2,500
14	Jiangsu Meilan Chemical Co., Ltd.	Jiangsu	1,500	1,200
Total			**103,800**	**74,300**

Source: CCM

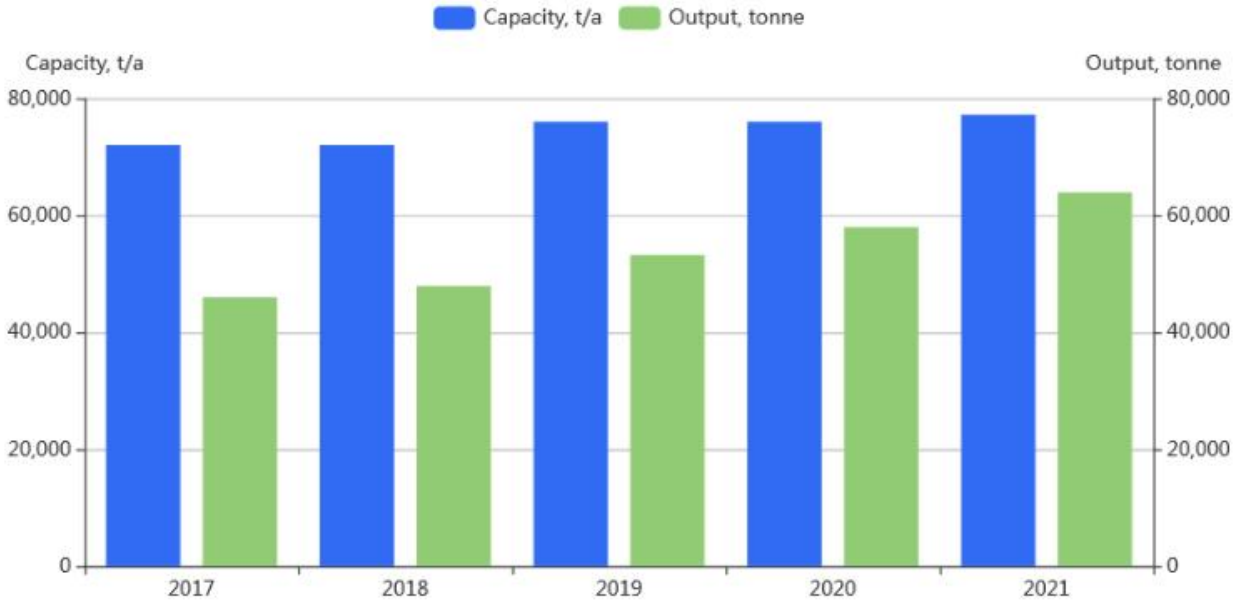
2.5 HFP

Hexafluoropropylene (HFP) is an important perfluoro intermediate used in the organic fluorine industry. It is one of the monomers of fluorinated polymer materials. HFP is widely used to make a variety of fluoridated fine chemical products, pharmaceutical intermediates, fire extinguishing agents, etc.

- Production

The growth of capacity of HFP slowed down in China, slightly increasing from 72,000 t/a in 2017 to 77,200 t/a in 2021. Meanwhile, boosted by the development of downstream industries, HFP output increased quickly to 63,900 tonnes in 2021 from 46,000 tonnes in 2017, with a CAGR of 8.6% in this period.

Figure 2.5-1 Capacity and output of HFP in China, 2017–2021



Source: CCM

The production of HFP is mainly concentrated in East China. Zhejiang Juhua Co., Ltd., Changshu 3F Zhonghao New Chemical Materials Co., Ltd. and Shandong Dongyue Polymer Material Co., Ltd. are the three largest HFP manufacturers in China, and their capacity together accounted for 50.5% of the total in 2021.

Table 2.5-1 Main active manufacturers of HFP in China, 2020–2021

No.	Producer	Location	Capacity, t/a		Output, tonne	
			2021	2020	2021	2020
1	Zhejiang Juhua Co., Ltd.	Zhejiang	15,000	15,000	12,900	11,500
2	Changshu 3F Zhonghao New Chemical Materials Co., Ltd.	Jiangsu	14,000	14,000	10,000	10,000

3	Shandong Dongyue Polymer Material Co., Ltd.	Shandong	10,000	10,000	8,200	7,500
4	Zhejiang Yonghe Refrigerant Co., Ltd.	Zhejiang	8,000	8,000	10,000	10,000
5	Changshu 3F Fluorochemical Industry Co., Ltd.	Jiangsu	6,000	6,000	4,500	4,300
6	Taixing Meilan New Materials Co., Ltd.	Jiangsu	5,400	5,400	3,500	3,000
7	Fujian Sannong New Materials Co., Ltd.	Fujian	5,000	5,000	4,000	3,300
8	Jiangxi Lee & Man Chemical Co., Ltd.	Jiangxi	3,200	2,000	2,000	1,200
9	Zhonghao Chenguang Research Institute of Chemical Industry Co., Ltd.	Sichuan	3,000	3,000	2,700	2,500
10	Daikin Fluorochemicals (China) Co., Ltd.	Jiangsu	3,000	3,000	2,300	1,900
11	Liaocheng Fuer New Material Technology Co., Ltd.	Shandong	2,000	2,000	1,600	1,500
Others			2,600	2,600	2,200	1,300
Total			**77,200**	**76,000**	**63,900**	**58,000**

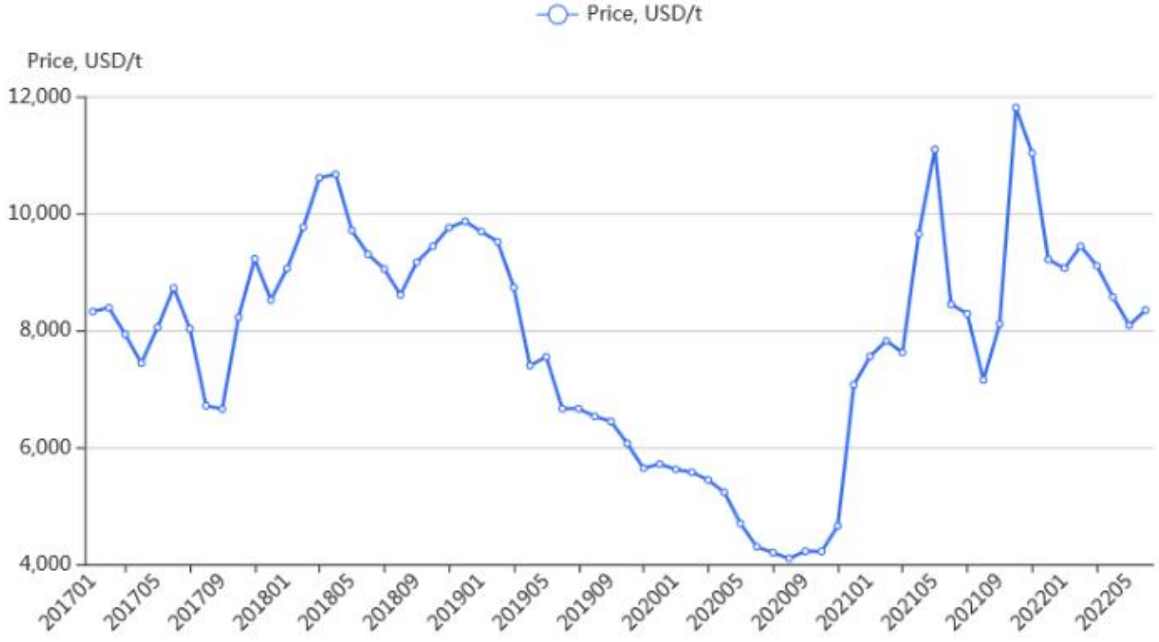
Source: CCM

- Price

In 2017–H1 2020, the ex-works price of HFP in China witnessed ups and downs. Price fluctuated between USD6,655/t and USD8,720/t in Q1–Q3 2017, and peaked at USD10,668/t in April 2018. After that, the price almost kept falling down for quite a while, closing at USD4,101/t in Aug. 2020, although there was a short increase in Q4 2018. Two things contributed to this drop. First, the demand for HFP was weak. Second, falling price of AHF brought down the production cost of HFP, so the price lost some support.

During Sept. 2020–June 2022, HFP price was highly volatile, as prices of its raw materials AHF and chloroform fluctuated during this period.

Figure 2.5-2 Ex-works price of HFP in China, Jan. 2017–June 2022



Source: CCM

3 Fluor resin

3.1 Overview

Fluor resin is the homopolymer or copolymer of monomers containing fluorine atoms. Because of its special structure, fluor resin obtains heat, acid, alkali and drug resistance, weatherability, hydrophobic and oilphobic, tarnish resistance as well as excellent performance in aspects of viscosity, biological adaptability, gas permeability, radiation sensitivity and low friction coefficient, etc.

With the introduction of fluor resins in 1960s, China has gradually become one of the largest fluor resin markets in the world. Supported by fast industry development and abundant fluorite resources in China, the fluor resin industry has developed rapidly. Fluor resin has also become one of the main exported fluoride products in China. And main products of fluor resin in China include PTFE, PVDF, FEP, PFA and ETFE.

PTFE is the principal product of fluor resins in China, followed by PVDF and FEP. The polymerization technique for fluor resins in China has reached the international level. However, China is weak in the production of functional fluor resins, especially high-end products. Also, processing equipment for fluor resins in China are inferior to those in most developed countries such as the US and Japan.

3.2 Technology

- Introduction of polymerization techniques

There are five types of synthesis techniques applied to manufacture different kinds of fluor resins in China, including:

- Suspension polymerization
- Emulsion polymerization
- Solution polymerization
- Bulk polymerization
- Aqueous polymerization

In China, suspension polymerization and emulsion polymerization are two key routes adopted by local manufacturers, while solution polymerization and bulk polymerization are less applied.

The production technique for fluor polymer monomer has developed rapidly in China during the last five years. There are several advanced devices for PTFE production in China, such as 8-cubic-meter suspension polymerizer, 4-cubic-meter dispersion polymerizer and 8-cubic-meter crushing and washing device. And the production technology of PTFE in China is close to the international advanced level. These devices can reduce the consumption volume of raw materials and improve the quality of PTFE. Many major manufacturers, such as Dongyue Group Ltd. (Dongyue Group), have used these devices to produce PTFE.

In April 2015, Zhonghao Chenguang Research Institute of Chemical Industry Co., Ltd. (Zhonghao Chenguang) was awarded the third prize of the Science and Technology Progress Award for the invention of "new industrialized technology of dispersed PTFE concentrated solution with a capacity of 2,500 t/a" in Sichuan Province. The project adopted the self-developed synthetic technology with the substitute for perfluorooctanoic acid (PFOA), which satisfies the demand from users for multiple product performances. The technology is a domestic initiative which reached the international advanced level, and got an international invention patent. Meanwhile, the facility constructed by Zhonghao Chenguang for the production of dispersed PTFE concentrated solution with the new technology is advanced domestically. The quality of dispersed PTFE concentrated solution has reached the international advanced level as well, and the product can replace the same kinds of the imported one.

In June 2017, after continuous scientific research and innovation, Dongyue Group successfully developed a series of raw materials of PTFE suspended fine powder, achieving the complete replacement of high-end material in China. The company's self-developed suspended fine powder DF-16A and DF-18A can be used in connecting cables and wear plates of top compartments of the high-speed rail.

In the past five years, China's fluor polymers have made a high-end breakthrough. The dispersion resin PTFE has been successfully applied to the production of 5G cables, realizing import substitution. Many domestic enterprises have achieved breakthroughs in lithium battery grade PVDF production technology, and their products have been supplied to lithium battery enterprises. The production technology of PFA in China has broken the monopoly of foreign countries, and Zhejiang Juhua Co., Ltd. (Zhejiang Juhua) has achieved mass production in 2020. The core preparation technology of ETFE has been successfully developed by top

players such as Dongyue Group and Zhejiang Juhua.

3.3 Production and market situation of major products

3.3.1 PTFE

At present, polytetrafluoroethylene (PTFE) is the most important fluoride polymer product, known as the "King of Plastics". It is a polymer polymerized by tetrafluoroethylene monomer, being transparent or opaque wax which is similar to PE. PTFE has good resistance to heat and chemicals, with low friction coefficient and excellent electrical insulation performance, and it can be continuously used at elevated temperature.

Because of the excellent properties of the product, PTFE industry in China has been expanding, with technology and equipment improved. Foreign investment and international cooperation have increased as well.

As a new product material, PTFE has a great development space. In recent years, China has issued series of industrial policies to support the development of new material industry. The *Three-year Plan on New Material Industry Standardization*, which was published in July 2013, clearly states that China shall produce PTFE with high-performance and other high-end fluor polymer as well as develop fluorine-containing intermediates and fine chemicals. This has laid a solid policy foundation for the development of PTFE industry.

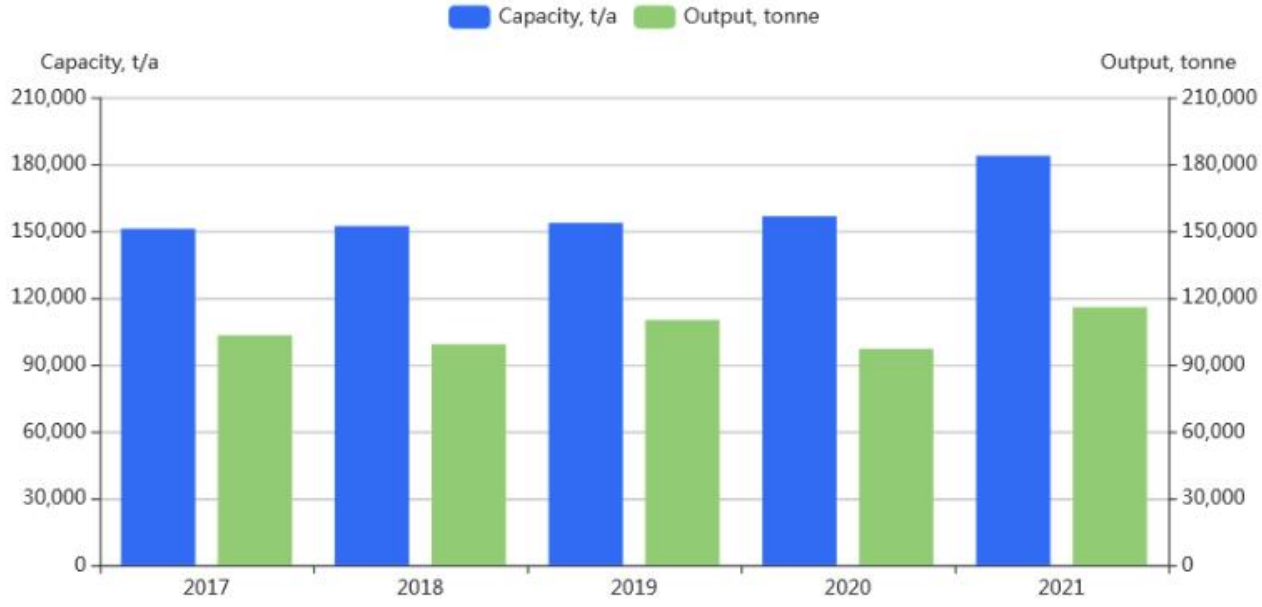
R22 is the raw material of tetrafluoroethylene (TFE) monomer which is produced by steam dilution cracking method, and TFE is the raw material of PTFE. Suspension PTFE is produced through polymerization process with the initiator (ammonium persulfate), while dispersion PTFE is produced through polymerization process with the dispersing agent (ammonium perfluorocaprylate solution).

3.3.1.1 Production situation

China has become one of the most important manufacturers of PTFE in the world. The capacity of PTFE in China increased from 151,000 t/a in 2017 to 183,800 t/a in 2021, at a CAGR of 5.0%. During 2017–2020, the industry slowed down its expansion. However, the industry ushered in a new round of capacity expansion as several planned new projects brought into operation in 2021.

The output of PTFE in China was 110,100 tonnes in 2019. However, the output decreased in 2020 as demand turned sluggish, impacted by the COVID-19. In 2021, the output increased by 19.3% year on year to 115,800 tonnes.

Figure 3.3.1.1-1 Capacity and output of PTFE in China, 2017–2021



Source: CCM

In 2021, there were 13 PTFE manufacturers in China and most of them are located in East China. About 50% of the PTFE capacity is concentrated in Shandong Province and Jiangsu Province.

In 2021, domestic capacity and output of PTFE were mainly concentrated in the top five enterprises; their combined capacity and output accounted for about 76.3% and 79.8% of the total in China. Among them, Dongyue Group Ltd. has a complete fluorine industrial chain. Its hydrogen fluoride and chloroform are used as raw materials for its own production of R22, and part of its R22 is used as the raw material for PTFE.

Table 3.3.1.1-1 Main active manufacturers of PTFE in China, 2020–2021

No.	Producer	Location	Capacity, t/a		Output, tonne	
			2021	2020	2021	2020
1	Dongyue Group Ltd.	Shandong	55,300	45,300	30,500	29,000
2	Zhonghao Chenguang Research Institute of Chemical Industry Co., Ltd.	Sichuan	30,000	30,000	30,400	17,000
3	Zhejiang Juhua Co., Ltd.	Zhejiang	23,000	15,000	10,000	9,700
4	Jiangxi Lee & Man Chemical Co., Ltd.	Jiangxi	16,700	6,700	12,000	9,000
5	Daikin Fluorochemicals (China) Co., Ltd.	Jiangsu	15,300	15,300	9,500	9,000
6	Fujian Sannong New Materials Co., Ltd.	Fujian	12,500	12,500	5,000	5,500
7	Changshu 3F Fuyuan New Materials Co., Ltd.	Jiangsu	11,800	11,800	8,000	7,200
8	Meilan Chemical Group Co., Ltd.	Jiangsu	7,000	7,000	4,000	4,500
9	Jiangxi Zhongfu Chemical Material Technology Co., Ltd.	Jiangxi	5,000	5,000	1,000	800
10	Shandong Hua Fluorochemical Co., Ltd.	Shandong	3,600	3,600	2,500	2,500
11	Solvay Specialty Polymers (Changshu) Co., Ltd.	Jiangsu	2,000	2,000	1,500	1,100
12	Luxi Chemical Group Co., Ltd.	Shandong	1,000	1,000	800	1,000
13	Zhejiang Yonghe Refrigerant Co., Ltd.	Zhejiang	600	600	600	600
Others			0	800	0	200
Total			**183,800**	**156,600**	**115,800**	**97,100**

Source: CCM

Table 3.3.1.1-2 Capacity and share of PTFE manufacturers in China, 2020–2021

Item	Capacity, t/a		Share	
	2021	2020	2021	2020
Top two	85,300	75,300	46.4%	48.1%
Top five	140,300	118,100	76.3%	75.4%

Source: CCM

Table 3.3.1.1-3 Output and share of PTFE manufacturers in China, 2020–2021

Item	Output, tonne		Share	
	2021	2020	2021	2020
Top two	60,900	46,000	52.6%	47.4%
Top five	92,400	73,700	79.8%	75.9%

Source: CCM

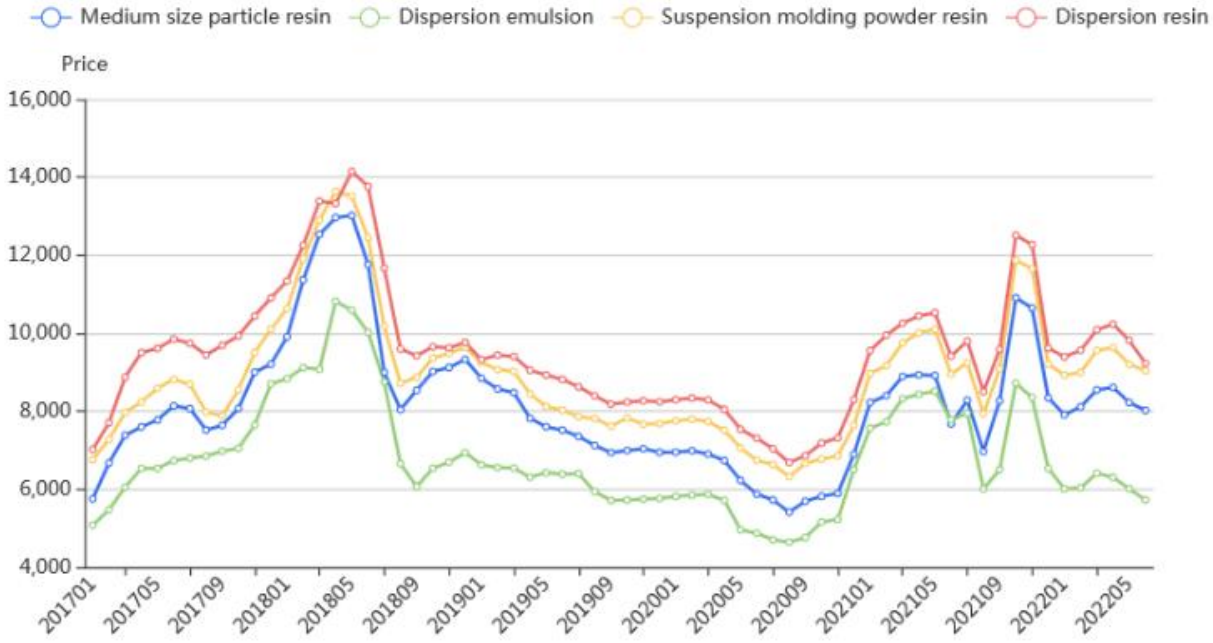
3.3.1.2 Price

Affected by the increasing price of fluorite and AHF, the price of PTFE increased in Jan. 2017–May 2018.

Since June 2018, due to the US Department of Commerce's preliminary anti-dumping measures on PTFE produced in China and India, and the impact of the Sino-US trade dispute, the price of PTFE fell. The trend did not stop in 2019, as PTFE market competition was increasingly fierce.

In 2020–H1 2022, there was little variation in the demand for PTFE, price changes were mainly inspired by fluctuations in the price of it raw material R22.

Figure 3.3.1.2-1 Ex-works price of PTFE in China, Jan. 2017–June 2022, USD/t



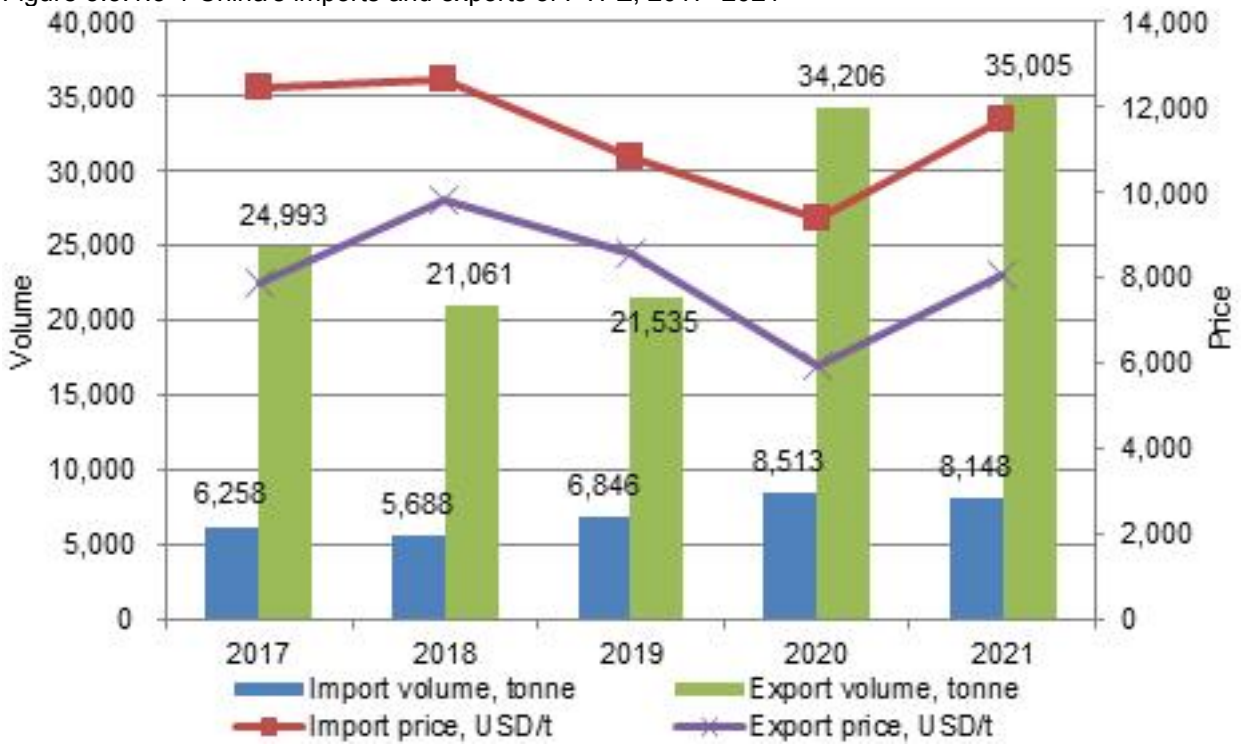
Source: CCM

3.3.1.3 Export and import

In China, the production technology of PTFE industry has gradually become mature, especially in medium- and low-end product fields, so there is no wonder that structural differences in import and export between PTFE products of different grades: medium- and low-end products become export-oriented, while high-end products still rely on imports.

China is a net exporter of PTFE. In 2017–2021, the import and export volume of PTFE in China fluctuated. Overall, the import and export volume of PTFE maintained at around 6,000 tonnes and 22,000 tonnes respectively during 2017–2019. However, both import and export exceeded 8,000 tonnes and 34,000 tonnes respectively in 2020–2021.

Figure 3.3.1.3-1 China's imports and exports of PTFE, 2017–2021



Source: China Customs & CCM

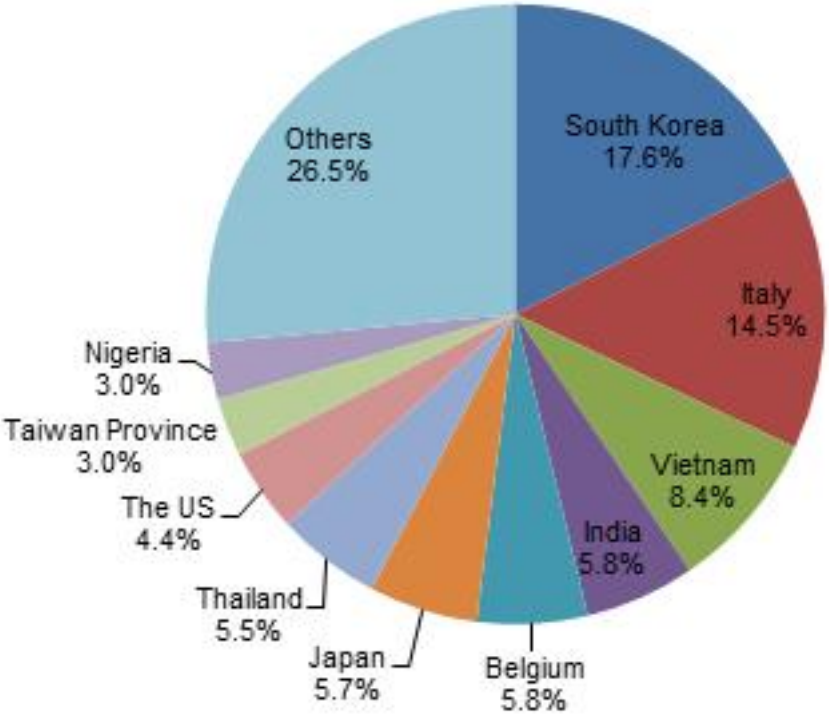
Table 3.3.1.3-1 China's imports and exports of PTFE, 2017–2021

Year	Import			Export		
	Volume, tonne	Value, USD	Price, USD/t	Volume, tonne	Value, USD	Price, USD/t
2017	6,258	77,765,221	12,427	24,993	196,554,725	7,864
2018	5,688	71,749,080	12,613	21,061	206,778,695	9,818
2019	6,846	74,301,337	10,854	21,535	184,175,136	8,552
2020	8,513	79,935,742	9,390	34,206	204,093,091	5,967
2021	8,148	95,136,281	11,676	35,005	282,578,994	8,072

Source: China Customs & CCM

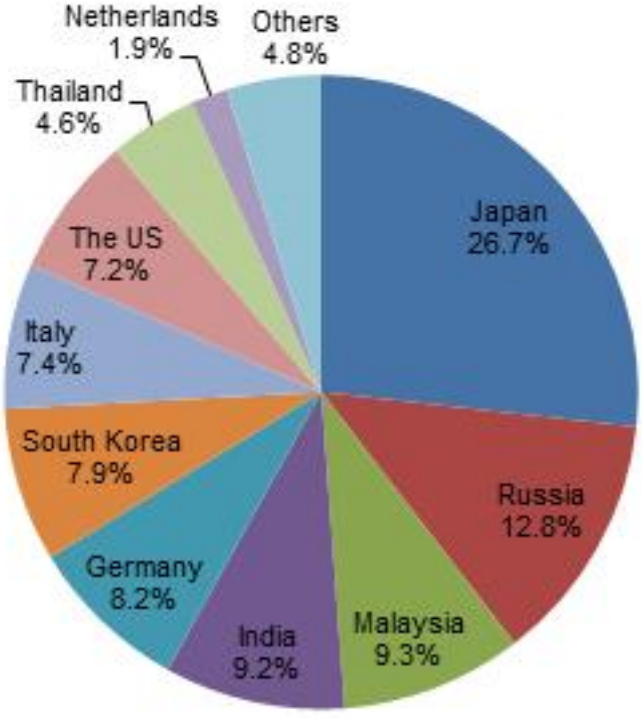
In 2021, export volume of China's PTFE to each of the top 10 export destinations exceeded 1,000 tonnes. South Korea was the largest export destination, accounting for 17.6% of total export volume, followed by Italy and Vietnam. While Japan, Russia and Malaysia were the top three import origins of PTFE to China by volume, together taking up 48.8% of the total import volume.

Figure 3.3.1.3-2 Top ten export destinations of PTFE from China by volume, 2021



Source: China Customs & CCM

Figure 3.3.1.3-3 Top ten import origins of PTFE in China by volume, 2021



Source: China Customs & CCM

3.3.1.4 Future trends

At present, the capacity of medium- and low-end PTFE in China has been in surplus, while that of high-end PTFE still needs to develop. In the future, PTFE manufacturers will focus more on high-end products.

In the near future, there are some expansion projects:

- Shandong Dongyue Polymer Material Co., Ltd.'s 20,000 t/a project;
- Fujian Haidefu New Material Co., Ltd.'s 2,800 t/a project;
- Taixing Meilan New Materials Co., Ltd.'s 10,000 t/a project;

- Zhejiang Yonghe Refrigerant Co., Ltd.'s 18,000 t/a project.

With increasing application of PTFE in 5G communication, environmental protection, automobile, aircraft, medical equipment and other new fields, it will not only prompt the growth of PTFE consumption, but also put forward higher and finer requirements for PTFE performance.

3.3.2 PVDF

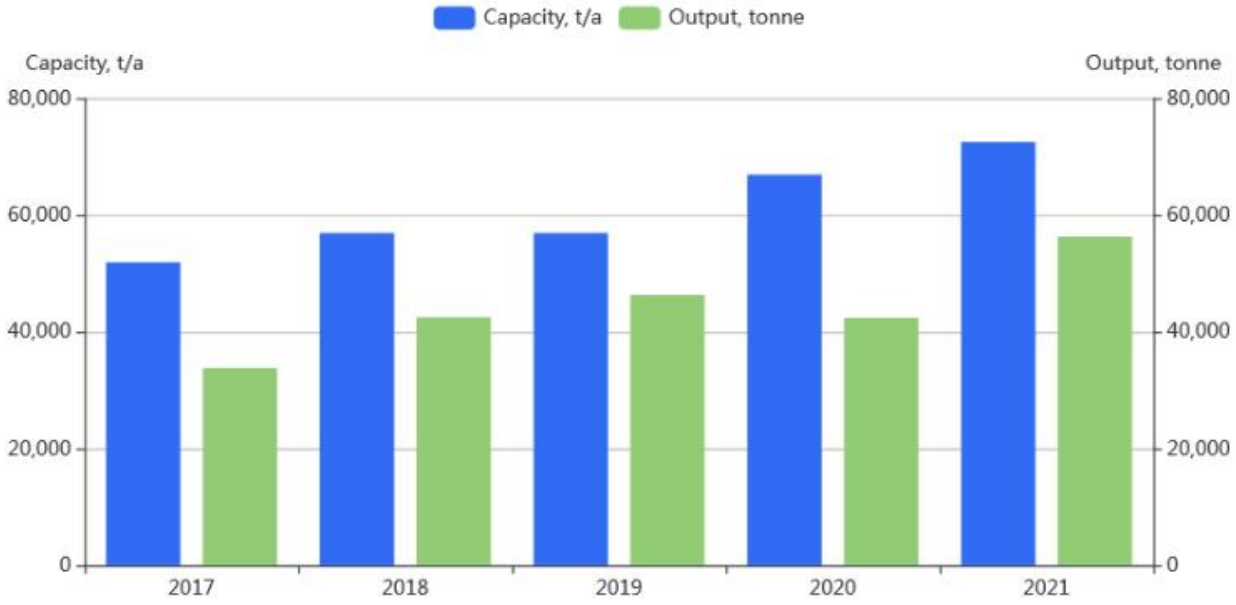
PVDF resin mainly refers to vinylidene fluoride homopolymer or copolymer of vinylidene fluoride and small amounts of other fluorine-containing vinyl monomers. PVDF resin has the characteristics of fluorine resin and normal resin. Besides its good chemical resistance, high temperature resistance, oxidation resistance, weatherability, and radiation-resistant performance, PVDF resin possesses special piezoelectric, dielectric, and thermoelectric properties, etc. It is currently the second largest product by output among fluorine-containing plastics, mainly used in three major areas, namely petrochemical, electronic and electrical, and fluorocarbon coating.

3.3.2.1 Production situation

The PVDF industry has developed very quickly in China, influenced by the increasing demand from downstream industries like lithium battery industry, coating industry and solar energy industry. The capacity of PVDF increased from 51,900 t/a in 2017 to 72,500 t/a in 2021, with a CAGR of 8.7%. On the whole, the output showed an upward trend in 2017–2021, except a dip in 2020.

Affected by the COVID-19 pandemic, the operating rate of PTFE industry decreased significantly in 2020, causing an 8.4% year-on-year fall in the output. Benefited from the rapid growth of the new energy industry, PVDF saw a surge in demand, and the output in 2021 jumped by 32.8% year on year to 56,300 tonnes.

Figure 3.3.2.1-1 Capacity and output of PVDF in China, 2017–2021



Note: The data of 2017–2019 have been revised.
Source: CCM

In 2021, there were 11 active PVDF manufacturers in China and most of them are located in East China. About 55% of the PVDF capacity is concentrated in Jiangsu and Zhejiang provinces.

In China, about half of the capacity and output are concentrated in the top three players, as they have the advantage in R&D, technology and capital.

Arkema (Changshu) Fluorochemical Co., Ltd. mainly purchases the raw material R152a from Changshu 3F Fluorochemical Industry Co., Ltd., and its products are widely used in the high-end market owing to the high quality and good reputation. Since 2006, the company has invested a lot in the research of PVDF in order to meet the increasing demand from downstream industries such as lithium battery, filtration membrane and solar panel.

Table 3.3.2.1-1 Main active manufacturers of PVDF in China, 2020–2021

No.	Producer	Location	Capacity, t/a		Output, tonne	
			2021	2020	2021	2020
1	Arkema (Changshu) Fluorochemical Co., Ltd.	Jiangsu	19,000	19,000	12,400	8,900
2	Shandong Huaxia Shenzhou New Material Co., Ltd.	Shandong	10,000	8,400	8,400	7,500
3	Inner Mongolia 3F Wanhao Fluorochemical Co., Ltd.	Inner Mongolia	7,000	7,000	7,000	7,000
4	Zhejiang Fluorine Chemical New Material Co., Ltd.	Zhejiang	6,000	6,000	4,800	4,500
5	Shandong Deyi New Material Co., Ltd.	Shandong	5,000	5,000	4,700	3,500
6	Kureha (Changshu) Fluoropolymers Co., Ltd.	Jiangsu	5,000	5,000	4,700	2,600
7	Ruyuan Dongyangguang Fluorine Resin Co., Ltd.	Guangdong	5,000	5,000	4,500	2,500
8	Solvay Specialty Polymers (Changshu) Co., Ltd.	Jiangsu	4,000	4,000	3,600	2,200
9	Zhejiang Juhua Co., Ltd.	Zhejiang	3,500	2,500	3,000	1,700
10	Sinochem Lantian Fluoro Materials Co., Ltd.	Zhejiang	3,000	3,000	2,400	2,000
11	Shandong Hua'an New Material Co., Ltd.	Shandong	3,000	/	800	0
Others			2,000	2,000	0	0
Total			**72,500**	**66,900**	**56,300**	**42,400**

Note: Longxing Chemical Stock Co., Ltd.' 2,000 t/a production line suspended since 2019.
Source: CCM

Table 3.3.2.1-2 Production share of top three PVDF manufacturers in China, 2020–2021

Item	2021	2020	Share	
			2021	2020
Capacity, t/a	36,000	34,400	49.7%	51.4%
Output, tonne	27,800	23,400	49.4%	55.2%

Source: CCM

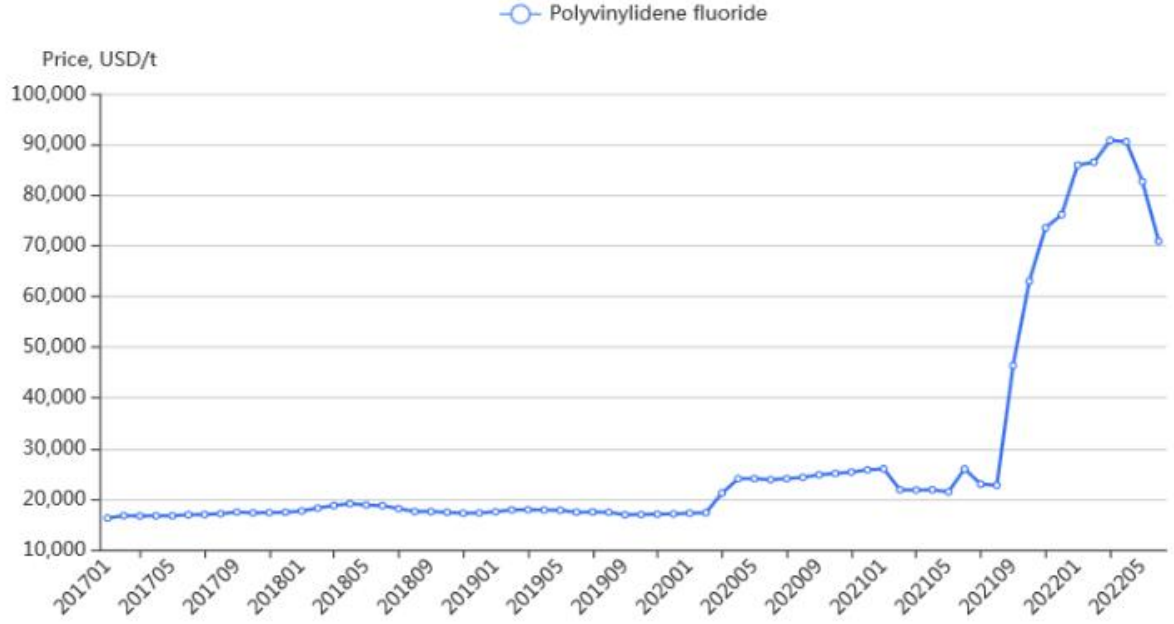
3.3.2.2 Price

On the whole, from Jan. 2017 to June 2022, the price trend of PVDF in China came in two stages:

- **Jan. 2017–Aug. 2021:** during this period, PVDF market was in a situation where supply exceeds demand, and PVDF price maintained relatively stable, mainly supported by production cost.
- **Sept. 2021–June 2022:** strong demand for PVDF from downstream industries pushed the price of PVDF up significantly. Although the price declined in Q2 2022, it was still at a very high level compared with the first stage.

Since H2 2020, PVDF had seen improved downstream demand in China, but the overall growth was not significant, affected by the COVID-19. From H2 2021, PVDF was in short supply in domestic market. Therefore, its price soared. At the same time, increasing raw material prices also contributed to the price surge. Under the explosive demand growth for the raw material R142b, the price of R142b rose, which in turn supported the price of PVDF.

Figure 3.3.2.2-1 Ex-works price of PVDF in China, Jan. 2017–June 2022



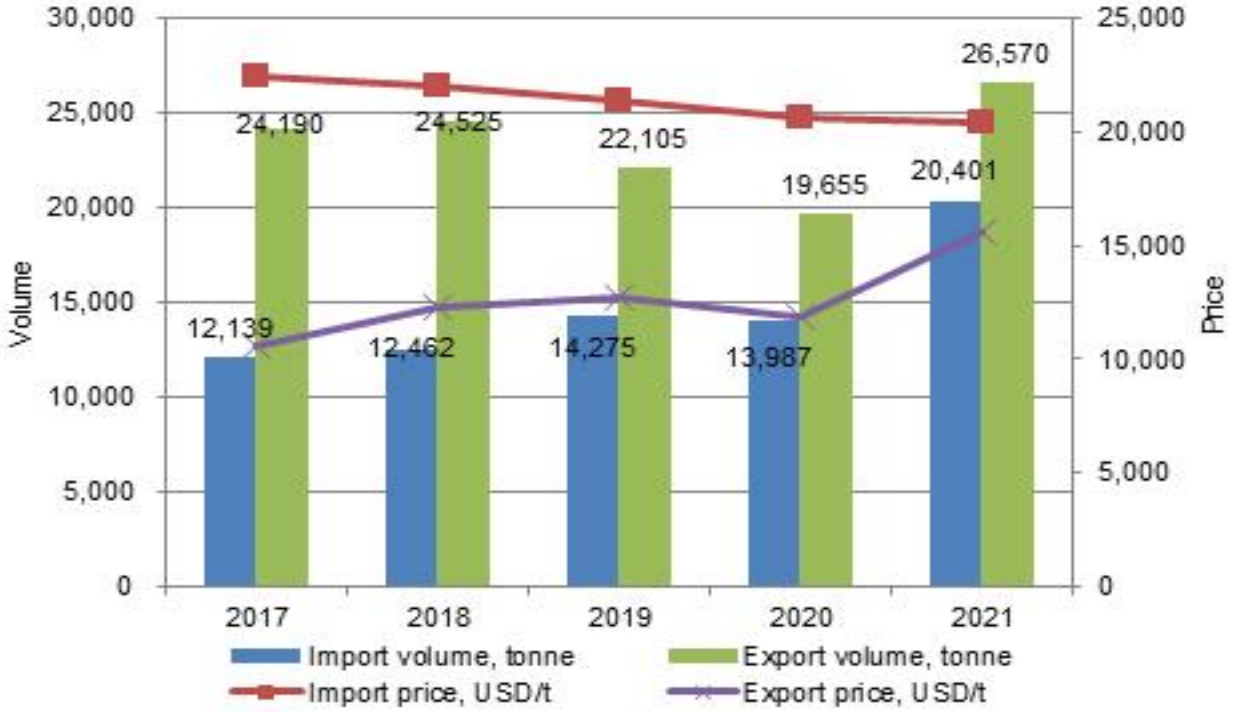
Source: CCM

3.3.2.3 Export and import

In 2017–2020, the import volume of other kinds of fluoride polymers in China fluctuated in a small range, but it jumped by 45.9% year on year to 20,401 tonnes in 2021, driven by booming downstream demand, especially from the lithium-ion battery industry.

The export volume increased slightly in 2018, but it dropped to 22,105 tonnes in 2019, and fell further to 19,655 tonnes in 2020, impacted by COVID-19 epidemic. In 2021, with eased COVID-19 situation, demand for lithium-ion batteries saw explosive growth along with the popularity of new energy vehicles in the world, thus driving up export of other kinds of fluoride polymers. PVDF export, in particular, contributed a lot to the increase.

Figure 3.3.2.3-1 Imports and exports of other kinds of fluoride polymers in China, 2017–2021



Note: The fluoride polymers here mainly include PVDF, ETFE, TFE, etc.
Source: China Customs & CCM

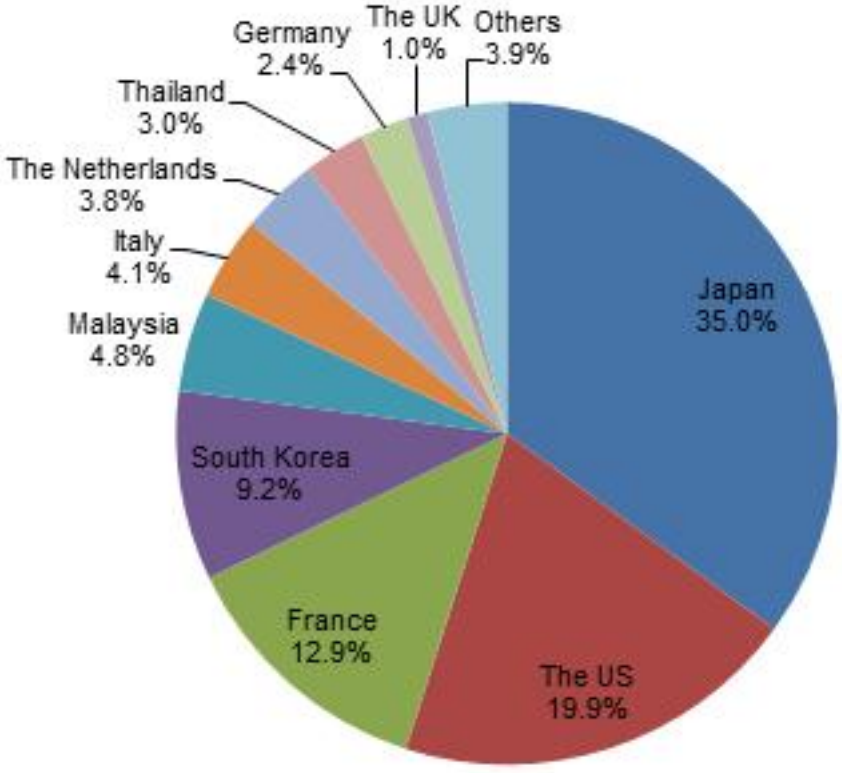
Table 3.3.2.3-1 Imports and exports of other kinds of fluoride polymers in China, 2017–2021

Year	Import			Export		
	Volume, tonne	Value, USD	Price, USD/t	Volume, tonne	Value, USD	Price, USD/t
2017	12,139	272,663,200	22,461	24,190	255,367,696	10,557
2018	12,462	275,016,151	22,069	24,525	300,217,645	12,241
2019	14,275	305,023,132	21,368	22,105	281,837,580	12,750
2020	13,987	289,127,534	20,671	19,655	233,376,013	11,874
2021	20,401	416,125,492	20,397	26,570	414,807,085	15,612

Note: The fluoride polymers here mainly include PVDF, ETFE, TFE, etc.
Source: China Customs & CCM

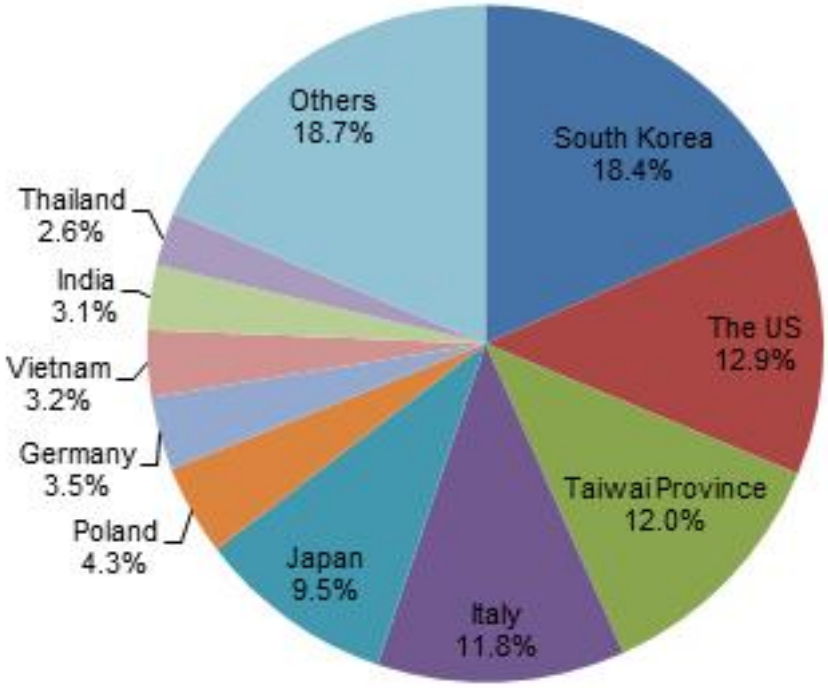
In 2021, Japan was the largest import origin of other kinds of fluoride polymers to China, accounting for 35.0% of the total import volume, followed by the US, France and South Korea. The top three export destinations by volume were South Korea, the US and Taiwan Province, the three together accounting for 43.3% of the total export volume.

Figure 3.3.2.3-2 Top ten import origins of other kinds of fluoride polymers in China by volume, 2021



Source: China Customs & CCM

Figure 3.3.2.3-3 Top ten export destinations of other kinds of fluoride polymers from China by volume, 2021



Source: China Customs & CCM

3.3.2.4 Future trends

Domestic PVDF product structure is seriously unbalanced, the products mainly satisfying low-end applications. In terms of application of domestic PVDF products, fluorocarbon coatings and fluororesins are the predominant application fields, and lithium-ion battery binders are entering the mainstream. Among them, the consumption of PVDF resin in the production of coating takes the largest part, and demand from the solar backsheet membrane and lithium-ion battery binder grows fastest.

Apart from being a key material in advanced defense military industry, high-end PVDF also becomes suitable for emerging fields for civilian use. At present, the photovoltaic industry, new energy industry and new materials industry are in rapid growth, and the demand for PVDF surges. However, the output of high-end PVDF products is small in China, and the products are monopolized by international brands. China mainly relies on import to meet the demand. As the lithium-ion battery market is developing rapidly, the demand from adhesive market is expected to increase greatly, and the consumption structure of PVDF will undergo a large adjustment in the next few years.

Currently, most of the domestic PVDF products are not of high quality, which are mainly used in fluorine coatings. Only some products can meet the requirements of lithium-ion battery binder. Therefore, it is expected that domestic PVDF manufacturers will pay more attention to the development, production and application of high-end products in the future.

3.3.3 FEP

Fluorinated ethylene propylene (FEP), commonly known as F46, is the copolymer of TFE and HFP, and the modified material of PTFE.

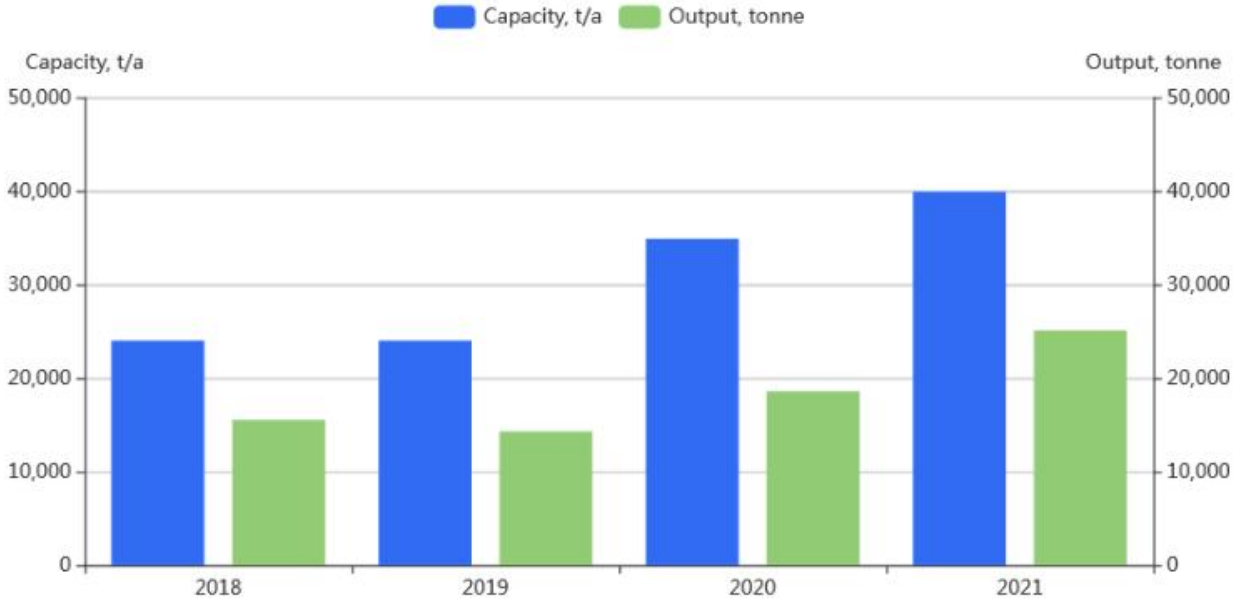
Based on the needs of processing, there are three kinds of FEP: granular material, dispersion and lacquer material. The granular material can be used for molding, extrusion and injection molding according to its melting index. Dispersion is used for impregnation sintering, and lacquer material is applied in spraying and so on.

FEP resin has a fairly definite melting point and can be formed and processed by the general thermoplastic process, which greatly simplifies the processing technique. This is the main reason why using HFP to modify PTFE which doesn't has such a feature.

FEP is mainly used in communication cables and wires, semiconductors, chemical anticorrosion, medical materials, automobiles and industrial coatings.

Because of the increasing demand from the electrical wire and cable industry, the capacity and output of FEP in China witnessed an increase in 2018–2021, to 39,900 t/a and 25,100 tonnes in 2021 respectively.

Figure 3.3.3-1 Capacity and output of FEP in China, 2018–2021



Source: CCM

In 2021, there were 9 FEP producers in China, with Shandong Huaxia Shenzhou New Material Co., Ltd. (Huaxia Shenzhou) ranking the first. The capacity of FEP in Huaxia Shenzhou increased from 5,600 t/a in 2020 to 10,600 t/a in 2021, accounting for 26.6% of the total capacity in China, which helped reinforce the company's leadership in China's FEP industry.

Table 3.3.3-1 Active manufacturers of FEP in China, 2020–2021

No.	Producer	Location	Capacity, t/a		Output, tonne	
			2021	2020	2021	2020
1	Shandong Huaxia Shenzhou New Material Co., Ltd.	Shandong	10,600	5,600	4,500	2,900
2	Daikin Fluorochemicals (China) Co., Ltd.	Jiangsu	6,000	6,000	4,000	3,700
3	Zhejiang Juhua Co., Ltd.	Zhejiang	5,000	5,000	3,300	2,700
4	Liaocheng Fuer New Material Technology Co., Ltd.	Shandong	5,000	5,000	3,100	2,400
5	Zhejiang Yonghe Refrigerant Co., Ltd.	Zhejiang	4,200	4,200	4,600	4,600
6	Changshu 3F Fuyuan New Materials Co., Ltd.	Jiangsu	3,500	3,500	2,160	1,200
7	Taixing Meilan New Materials Co., Ltd.	Jiangsu	3,000	3,000	2,000	70
8	Chongqing Xinfu Technology Co., Ltd.	Chongqing	2,500	2,500	1,400	1,000
9	Shandong Hua Fluorochemical Co., Ltd.	Shandong	100	100	40	30
Total			**39,900**	**34,900**	**25,100**	**18,600**

Source: CCM

3.3.4 PFA

- Overview of PFA in China

Soluble polytetrafluoroethylene, also known as perfluoroalkoxy alkane (PFA), is a copolymer of tetrafluoroethylene (TFE) and perfluoroethers ($C_2F_3OR^f$, where R^f is a perfluorinated group such as trifluoromethyl (CF_3)).

The chemical stability, physical and mechanical properties, electrical insulation, lubrication, inviscid property, ageing resistance and thermal stability of PFA are in good performance, which is similar to ordinary PTFE; but the high-temperature mechanical strength of PFE is about twice higher than that of ordinary PTFE. PTFE is difficult to process, but PFA has a good thermoplastic feature which has overcome this defect. PFA is widely used in the semiconductor industry, medical, and chemical anticorrosion, as well as in automobile and other fields.

- Production of PFA in China

In the past few years, the PFA industry in China has developed rapidly, and the production of PFA has achieved the process from scratch. At present, Zhejiang Juhua Co., Ltd. is the only enterprise to achieve PFA mass production, with a capacity of 2,000 t/a. Besides, some manufacturers such as Zhonghao Chenguang have also completed pilot development projects for PFA.

It is estimated that more producers would develop the production technology of the PFA in the future supported by the government policy, and it is likely that more and more fluor polymer producers will realize the batch production of PFA in China in the next few years.

Although the domestic PFA industry is developing rapidly, most of the PFA still need to be imported. The main importing countries are Japan and the US, and the major import brands of PFA are DuPont, Daikin Industries, AGC and Solvay.

Table 3.3.4-1 List of projects expected to be built up and operate in the near future

No.	Producer	Location	Expansion, t/a
1	Shandong Huaxia Shenzhou New Material Co., Ltd.	Shandong	2,000
2	Zhejiang Fluorine Chemical New Materials Co., Ltd.	Zhejiang	2,000
3	Zhejiang Yonghe Refrigerant Co., Ltd.	Fujian	3,000
4	Fujian Haidefu New Material Co., Ltd.	Fujian	500

Source: CCM

3.3.5 ETFE

- Overview of ETFE in China

Ethylene tetrafluoroethylene (ETFE) is a material which has the corrosion resistance as PTFE but has overcome the non-stick defect of PTFE. The average linear expansion coefficient of ETFE is close to that of carbon steel, making ETFE become the ideal composite of metal.

The ETFE membrane is an excellent material for constructing transparent building, and has been proven to be a reliable and economical roofing material in many projects. The unique viscosity resistance of ETFE membrane makes it has the characteristics of high anti-fouling and easy-to-clean. Usually, the rainwater can remove the main dirt on the surface.

- Production of ETFE in China

ETFE has been well known in China since the construction of the Water Cube project. It will have a bright future in China as it was listed as one of the key products encouraged to develop in China during the period of the 12th Five-Year Plan (2011–2015).

However, China is weak in the production of ETFE. Up to 2021, only Shandong Dongyue Future Hydrogen Energy Materials Co., Ltd. had 500 t/a of ETFE in China. At present, the capacity of ETFE cannot meet the domestic demand, most of the ETFE still need to be imported. Most of the ETFE is imported from Japan and the US, and from companies like DuPont, Daikin, AGC and so on.

Driven by the domestic research and development of the production technology of ETFE and increasing demand from global market, the ETFE industry in China will continuously develop at a fast pace, and some producers and institutes will engage in developing the production technology of ETFE in the next few years.

Table 3.3.5-1 List of projects expected to be built up and operate in the near future

No.	Producer	Location	Expansion, t/a
1	Zhejiang Juhua Co., Ltd.	Zhejiang	3,000
2	Guangxi Tiandong Jinfu Industrial Co., Ltd.	Guangxi	3,000
3	Shandong Dongyue Future Hydrogen Energy Materials Co., Ltd.	Shandong	2,500

Source: CCM

4 Fluor rubber

4.1 Overview

Fluor rubber is one of synthesized elastomer whose carbon has fluorine atom in main chain or side chain. With characteristics of heat resistance, oil resistance, solvent resistance and good mechanical properties, fluor rubber is widely applied in national defense, military, aerospace, automobile, and petrochemical industries. Fluor rubber has become the indispensable fundamental material in modern industry.

China developed fluor rubber in 1958 mainly because of the demand from the military industry and then it began to be applied in civilian industry gradually. With the rapid development of Chinese automobile industry in recent years, the demand for fluor rubber increased rapidly. There are four main fluor rubbers produced in China:

- Fluor rubber 26, copolymer of 1,1-difluoroethylene and hexafluoropropylene.
- Fluor rubber 246, copolymer of difluoroethylene, tetrafluoroethylene and hexafluoropropylene
- Fluor rubber TP, copolymer of tetrafluoroethylene and propylene
- Fluorinated silicon rubber

There are also some products with small output such as fluor rubber 23 (copolymer of 1,1-difluoroethylene and chlorotrifluoroethylene) and perfluoroelastomers which are applied in military industry.

4.2 Technology

- Polymerization technique route

There are two technique routes for polymerization of fluor rubber in China, emulsion polymerization by free radical and emulsion polymerization by seed.

1. Emulsion polymerization by free radical

This route is the main technique route in China; there are four features in this route:

- The pressure is high, normally in the range of 2.2–10.4 MPa.
- The medium is water.
- The initiator is organic or inorganic peroxide.
- The emulsifier is perfluorooctanoic acid ammonium salt.

2. Emulsion polymerization by seed

There are two stages in this synthesis route:

- First, a bit of polymers, also called seed, is synthesized with the initiators such as ammonium persulfate.
- Second, polymerization happens when the seed synthesized in the first stage and initiators such as organic peroxide react.

The route, emulsion polymerization caused by free radical, with mature technique and easy production process, is popular in the world. Almost all China's producers produce fluor rubber in this route.

- Polymerization production craft

There are two different emulsion polymerization crafts for fluor rubber. They are continuous polymerization process and intermittent polymerization process.

1. Continuous polymerization process

In continuous polymerization process, all the monomer is pre-mixed and fed into reactor, and the initiator and dispenser are continually added into reactor through metering pump.

2. Intermittent polymerization process

In intermittent polymerization process, part of the monomer and other reaction material is pre-mixed first and fed into reactor, and during the reaction process more monomer could be added gradually.

In China, the continuous polymerization process is more commonly used than the intermittent polymerization

process. Some producers would produce some special products with intermittent polymerization process to meet the demand of military industry but the output of these products is small and some special raw materials such as flurane series monomer is depending on import.

In continuous polymerization process technology, China's producers keep abreast of the international producers. There is almost no any technology gap between Chinese producers and international producers in the technique of the monomer producing, different fluorine content of fluor rubber producing, wide molecular weight distribution and control and low mooney viscosity products producing.

In fact, the polymerization technology of fluor rubber is not the most difficult, the most critical point is the modification and processing technology of fluor rubber, which are described below:

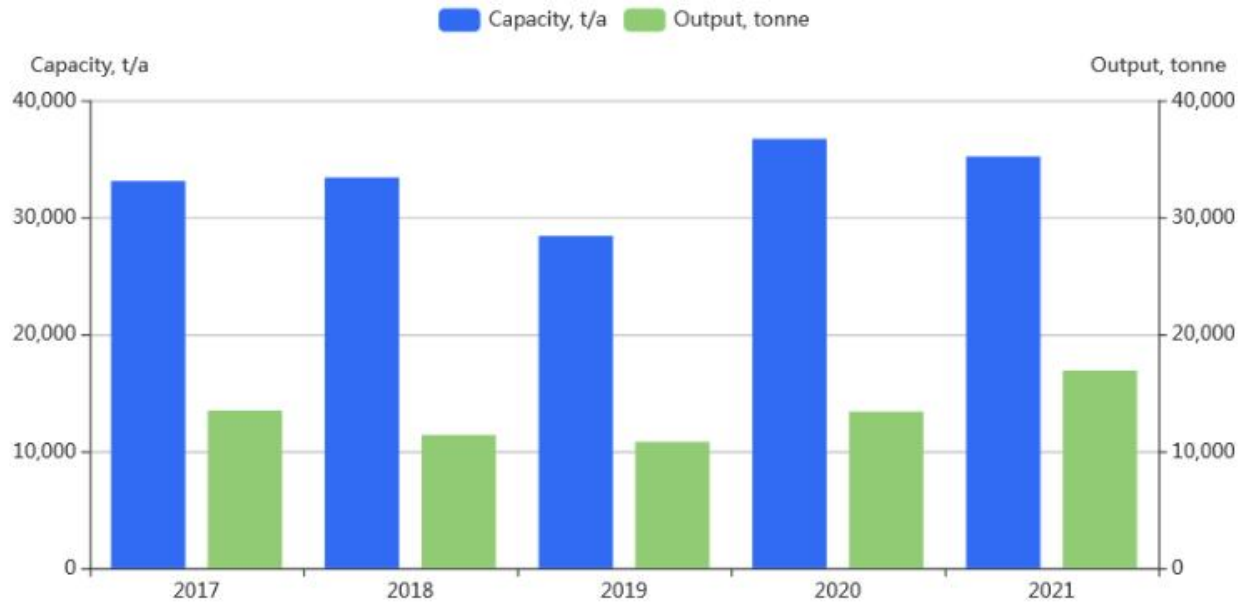
- Modification: different components and properties of fluoroelastomer are realized by changing the monomer.
- Processing: changing the vulcanization system during processing to achieve different physical properties of fluor rubber.

4.3 Production situation

Subject to the backwardness of processing and application technology, the production of fluor rubber products is mainly concentrated in foreign giants. Compared with foreign countries, China still lags behind in the variety and application of fluor rubber products. In addition, fluor rubber localization rate is not high in China, and high-end fluor rubber products still rely on import to meet market demand.

In 2017–2021, the capacity of fluor rubber in China fluctuated; it was 35,200 t/a in 2021. The output rebounded in 2020 after declines in 2018 and 2019. During 2020–2021, increasing demand from downstream markets, especially in the automotive industry, led to a surge in the output of fluor rubber.

Figure 4.3-1 Capacity and output of fluor rubber in China, 2017–2021



Source: CCM

In 2021, there were 10 fluor rubber producers in China. The largest manufacturer in China was Shandong Huaxia Shenzhou New Material Co., Ltd., with 10,000 t/a production capacity, or 28.4% of the national total. However, Haohua Technology had the largest output, reaching 4,800 tonnes, making up 28.4% of the total output.

Table 4.3-1 Active manufacturers of fluor rubber in China, 2020–2021

No.	Producer		Location	Capacity, t/a		Output, tonne	
				2021	2020	2021	2020
1	Shandong Huaxia Shenzhou New Material Co., Ltd.		Shandong	10,000	10,000	2,600	1,900
2	Daikin Fluorochemicals (China) Co., Ltd.		Jiangsu	6,000	6,000	3,800	3,100
3	Haohua Technology	The Chemours Chenguang Fluoromaterials (Shanghai) Co., Ltd.	Shanghai	4,000	5,500	3,000	2,600
		Zhonghao Chenguang Research Institute of Chemical Industry Co., Ltd.	Sichuan	1,500	1,500	1,800	1,400
4	3F	Inner Mongolia 3F Wanhao Fluorochemical Co., Ltd.	Inner Mongolia	3,500	3,500	1,000	700
		Changshu 3F Fuyuan New Materials Co., Ltd.	Jiangsu	1,000	1,000	600	400
5	Solvay Specialty Polymers (Changshu) Co., Ltd.		Jiangsu	3,000	3,000	1,500	1,300
6	Zhejiang Juhua Co., Ltd.		Zhejiang	3,000	3,000	1,100	1,000
7	Jiangsu Meilan Chemical Co., Ltd.		Jiangsu	2,000	2,000	800	500
8	Zhejiang Fluorine Chemical New Material Co., Ltd.		Zhejiang	1,200	1,200	700	500
Total				**35,200**	**36,700**	**16,900**	**13,400**

Source: CCM

4.4 Future trends

In recent years, the capacity of fluor rubber in China has increased quickly. With the rapid expansion, there is overcapacity in China's raw fluor rubber industry, but some products such as perfluoroelastomers are still in short supply. And the production of fluor rubber will be concentrated in raw fluor rubber, especially fluor rubber 26. Domestic fluor rubber manufacturers are expected to pay more attention to the production of high-quality fluor rubber.

Automobile industry is the largest application field of fluor rubber. China is one of the major automobile producing countries, and the rapid development in automobile industry will be the most important driving force for fluor rubber industry in China. In addition, petrochemical, aerospace, electric appliance, machine manufacture, and light industries have also developed rapidly in recent years. The demand for fluor rubber in these industries will continue to increase.

Though the quality of fluor rubber has been improved greatly, fluor rubber industry in China is still behind in the development of new product and compound rubber. And the mechanic property of fluor rubber should be further improved to meet different requirements. Thus, producing new products is the developing trend of fluor rubber and the development of fluor rubber with good properties of high fluorine content, low temperature and alkali resistance will be the hot point in fluor rubber industry in China.

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