

VANADIUM ANNUALS



2020 FERROALLOYNET

EDITOR : TORIA

TEL : +86 28 8521 7008 OR

ADDRESS : 8-10, F14, BLOCK 1, LAIMENGDUHUI, NO.51, SECTION 4, SOUTH SECOND RING ROAD, WUHOU DISTRICT, CHENGDU,
SICHUAN, CHINA

PUBLISH BY : FERROALLOYNET

EMAIL : CUSTOMERSERVICE@FERROALLOYNET.COM

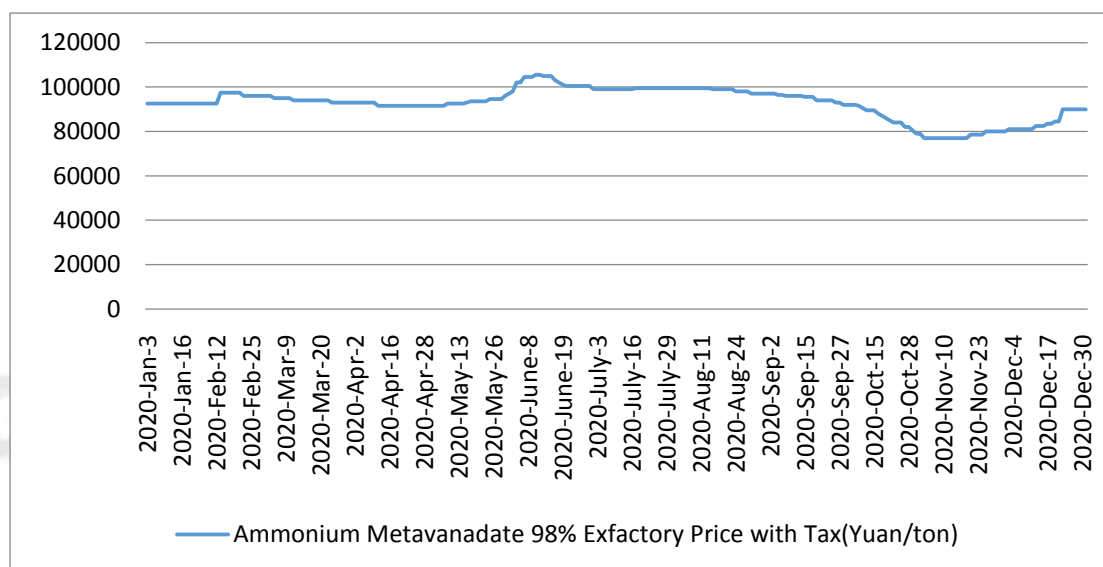
WEBSITE: WWW.FERROALLOYNET.COM

Chapter I Review of Vanadium Market in 2020	3
Section I Ammonium Metavanadate	3
i. Ammonium metavanadate market review in the first quarter	3
ii. Ammonium metavanadate market review in the second quarter	4
iii. Ammonium metavanadate market review in the third quarter	4
iv. Ammonium metavanadate market review in the fourth quarter	5
Section II Vanadium Pentoxide	5
i. V ₂ O ₅ market review in the first quarter	5
ii. V ₂ O ₅ market review in the second quarter	6
iii. V ₂ O ₅ market review in the third quarter	6
iv. V ₂ O ₅ market review in the fourth quarter	6
Section III Ferrovanadium	7
i. FeV market review in the first quarter	7
ii. FeV market review in the second quarter	7
iii. FeV market review in the third quarter	8
iv. FeV market review in the fourth quarter	8
Section IV Vanadium-nitrogen Alloy	8
i. VN alloy market review in the first quarter	9
ii. VN alloy market review in the second quarter	9
iii. VN alloy market review in the third quarter	9
iv. VN alloy market review in the fourth quarter	10
Chapter II Bidding Situation of Steel Mills in 2020	10
Section I Total Bidding Volume of FeV and VN Alloy in 2020(unit: ton)	10
Section II Bidding Average Price of FeV and VN Alloy in 2019(unit: 10000 Yuan/ton)	11
Chapter III Review of International Market Price in 2020	12
Section I Ferrovanadium	12
Section II V ₂ O ₅	13
Chapter IV Review of International Market Imports and Exports in 2020	14
Section I Review of exports of vanadium products	14
Section II Review of imports of vanadium products	15
Chapter V Operation Rate in 2020	16
Chapter VI Prediction and Analysis in 2021	17
Section I Supply	17
Section II Demand	17

www.ferroalloynet.com: In 2020, the whole vanadium market rose first and then restrain, and the overall trend was weak. From January to the middle of February: before the Spring Festival, the steel plants were actively preparing goods, and then the inquiry of vanadium market increased, and the price rose slightly; from the middle of February: due to the COVID-19 epidemic, market closed during Spring Festival holiday; from March to April: the logistics gradually recovered, and the vanadium plants gradually resumed production, but under the pressure of high inventory of steel plants, the demand was weak, therefore, the vanadium market was weak, and the production enthusiasm of manufacturers was not high; from early June to October: import resources increased greatly, export decreased, domestic production capacity increased, supply of vanadium products exceeded demand, and vanadium price decreased; from November to mid December: the vanadium price was low, the procurement of steel plants increased, and the traders build their stocks at a low price and didn't sell the goods, and the manufacturers were reluctant to sell, and then the vanadium price stopped falling and rebounded; in late December, with the increase of traders' sales, the supply of vanadium products exceeded the demand, thus the price fell back gradually.

Chapter I Review of Vanadium Market in 2020

Section I Ammonium Metavanadate



i. Ammonium metavanadate market review in the first quarter

In the first quarter, the price of domestic vanadium market rose rapidly and then fell slightly. In January, the domestic market trend was stable. The impact of pre Festival stock preparation on the demand of alloys was limited. The price of chemical grade ammonium

metavanadate was not driven. The price of metallurgical grade ammonium metavanadate 98% was about 90000 yuan / ton by cash, while the chemical grade was slightly higher at about 95000 yuan / ton. After the Spring Festival, there were not many manufacturers resuming production due to the COVID-19 epidemic, and the price of downstream alloys rose first, and then followed by ammonium metavanadate. In the middle of February, it rose to the first small peak in the first half of the year. The average prices of chemical grade and metallurgical grade ammonium metavanadate increased by about 5000 yuan / ton respectively. In March, with the resumption of raw material enterprises and the weak demand of downstream alloys, the market price began to decline slightly, close to the level before the rise. In March, with the resumption of raw material enterprises and the weak demand of downstream alloys, the market price began to decline slightly, closed to the level before the rise.

ii. Ammonium metavanadate market review in the second quarter

In April, the price of ammonium metavanadate was in the stage of stopping falling, and the price was stable for one month. In May, the price of ammonium metavanadate was once again driven by the increase of vanadium products used in metallurgical industry, and its price began to rise slowly. In early June, due to the lack of spot goods in the vanadium market, the low inventory of manufacturers and the lack of shipping from traders, the alloy manufacturers increased the procurement of metallurgical grade ammonium metavanadate, resulting in the price up of ammonium metavanadate. In mid June, it rose to the second small peak in the first half of the year. The price of metallurgical grade ammonium metavanadate was 105000 yuan / ton, and the price of chemical grade ammonium metavanadate was 108000 yuan / ton. Compared with 2019 and early 2020, the price difference between chemical and metallurgical ammonium metavanadate was smaller. Affected by the epidemic, the overseas market of vanadium chemical products was hit, and the export consumption was greatly reduced. Until the middle of 2020, the demand for vanadium in the chemical industry has not increased significantly.

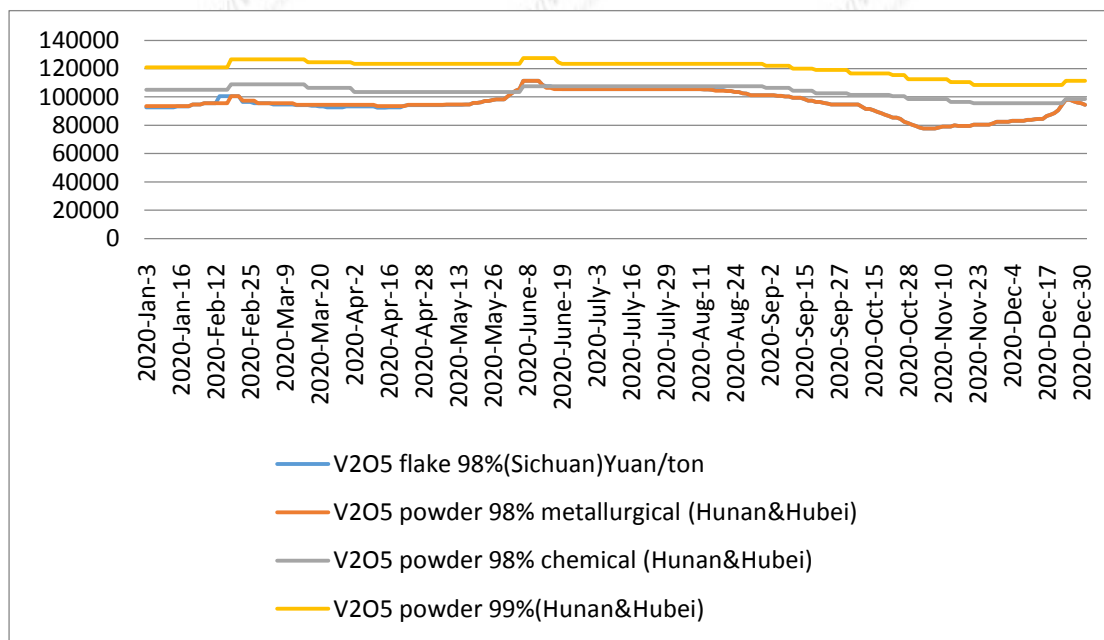
iii. Ammonium metavanadate market review in the third quarter

In the third quarter, the market of ammonium metavanadate was deadlocked and weak. In July, the mainstream V₂O₅ flake manufacturers supported the price. After a slight drop, the price of ammonium metavanadate barely stabilized. The market inquiry activity was not high and the transaction was deadlocked. From August to September, some factories stopped production in the early stage resumed production. In addition, the quantity of imported vanadium pentoxide and ferrovandium increased greatly. The market of vanadium raw materials was in a state of oversupply, and the price of ammonium metavanadate followed the downward trend. In the third quarter, the cash price of ammonium metavanadate decreased from 99000-100000 yuan / ton to 91000-93000 yuan / ton, with a decrease of 7000-8000 yuan / ton.

iv. Ammonium metavanadate market review in the fourth quarter

In October, the price of ammonium metavanadate followed the downward trend of alloy market price, and the inventory of raw materials was on the high side. The price of ammonium metavanadate dropped from 91000-93000 yuan / ton to 76000-78000 yuan / ton by cash. With the price of ammonium metavanadate falling to less than 90000 yuan by cash, the number of stone coal vanadium extraction plants stopped production increased, the manufacturers in production were reluctant to sell at low price, and the inventory of V2O5 flake decreased. The price of vanadium was low and traders increased their stocks. In early November, the price of ammonium metavanadate stopped falling and rebounded, rising from low price of 76000-78000 yuan to 88000-92000 yuan / ton in late December, and then stabilized.

Section II Vanadium Pentoxide



i. V2O5 market review in the first quarter

In the first quarter, the market price of vanadium pentoxide also showed a small peak, which was also due to the impact of the epidemic on the output and logistics, as well as the driving force of the rise of alloys price. The market price of V2O5 flake rose from about 92000 yuan / ton at the beginning of 2020 to about 100000 yuan / ton. The price of metallurgical grade V2O5 powder 98% and V2O5 flake has been almost the same. The price of high-purity V2O5 powder has lagged behind. It is difficult for downstream enterprises of chemical grade V2O5 powder to accept the rapid price rise, thus the trading volume is less. However, due to the price rising of ammonium metavanadate, the cost of V2O5 powder enterprises increases rapidly and the quotations of subsequent products have to be increased.

ii. V2O5 market review in the second quarter

In the second quarter, the V2O5 market began to strengthen from weak situation, and the price of V2O5 flake began to rise from about 93000 yuan / ton. In June, the prices of V2O5 flake large factories were raised by 11000 yuan / ton, which provided market support. At this time, the steel market was relatively prosperous, and the steel plants were actively purchasing vanadium alloys, so the alloy factories increased the purchase volume of V2O5 flake, of course, there is no lack of speculation in the late period. In the second small peak in mid June, the market price of V2O5 flake rose to about 112000 yuan / ton, and it also fell with the weakness of alloy market in late June.

iii. V2O5 market review in the third quarter

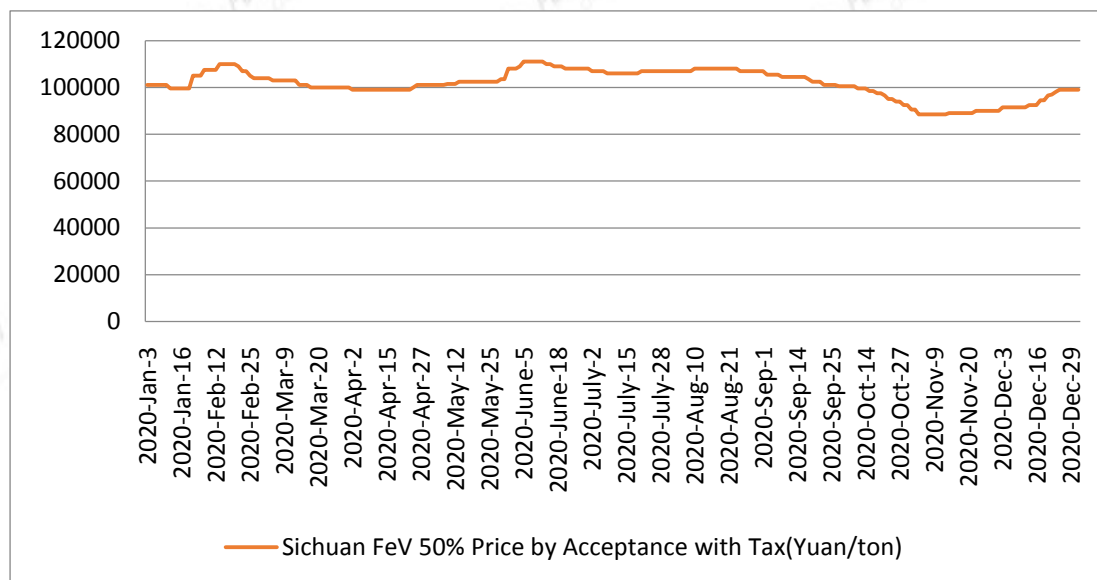
In July, V2O5 flake large factories supported the market and did not adjust the price, and the price kept at 107000 yuan / ton by acceptance with tax. The transaction of vanadium alloy was not smooth, the purchasing enthusiasm of alloy factories was not high, and the price of V2O5 flake retail investors was gradually equal to that of large factories. In August, as the import of V2O5 flake increased greatly, the domestic production increased, the supply of V2O5 flake exceeded the demand, and the retail price of V2O5 flake decreased continuously from 105000-106000 Yuan/ton to 94500-95000 yuan / ton by cash with tax, a decrease of nearly 10000 yuan / ton. The alloy factories were more active in purchasing import resources, and the large factories have to follow the price reduction to facilitate shipment. In early September, the prices of large factories were reduced to 100000 yuan / ton, but the transaction was still not ideal, with a little inventory pressure. The price of V2O5 powder declined with the trend of V2O5 flake in general. The price of chemical grade V2O5 powder 98% dropped from 106000-109000 yuan / ton to 100000-103000 yuan / ton by cash with tax. The fluctuation was relatively delayed compared with metallurgical grade. The overall decline in the third quarter was about 6000 yuan / ton in the third quarter.

iv. V2O5 market review in the fourth quarter

In October, it was difficult to change the weak situation. Due to the entry of imported V2O5 flakes, it was difficult to consume in the short term. Therefore, the price of V2O5 flake dropped from 94500-95000 yuan / ton to 77500-78000 yuan / ton by cash with tax in early November. At this time, the number of inquiries and procurement of traders increased, and they intended to hoard goods and waited for the price rise. In addition, the price of V2O5 flake was so low that the manufacturers were reluctant to sell. In early November, the price of V2O5 flake stopped falling and rebounded. Driven by the active procurement of steel plants and the price increase of large factories, in addition, traders hold goods without selling, the price of V2O5 flakes kept rising. In mid December, there was a short-term jump phenomenon. The transaction price rose to 100000-101000 yuan/ton by cash, and the traders build their stocks at a low price. Now shipment with high price

increased, and the price dropped slightly. The price of V2O5 powder was adjusted at the same time, first falling, then rising, and then falling slightly, mainly because the price of ammonium metavanadate was adjusted.

Section III Ferrovandium



i. FeV market review in the first quarter

The Spring Festival in 2020 was early, and some enterprises began to have a holiday in the middle and late January. There was less trading in the retail market before the festival, and the steel plants also calculated the purchasing date according to the national legal holidays. It was planned to come back in early February when the procurement would take place. Therefore, the market before the festival was calm, and there was no good trend like previous years. However, due to the unpredictable epidemic situation, the steel plants rushed to purchase after the festival but manufacturers increased their quotations, the domestic price of FeV50 rose from about 100000 yuan / ton at the beginning of 2020 to more than 110000 yuan / ton. Then, from late February to March, the logistics was smooth and the spot goods in the closed area flowed to the market. At this time, the steel mills had the problem of overstocking, and the vanadium price gradually fell to the price at the beginning of 2020.

ii. FeV market review in the second quarter

In April, the overall performance of vanadium market was stable. With the effective control of the epidemic situation, Wuhan was unsealed, which indicated that the domestic epidemic crisis had passed, all regions and industries were gradually returning to work, and infrastructure, engineering and real estate also ushered in an important rush period. Coupled with the warm and cool climate, the sales of steel products continued to increase, and inventory also showed a step-by-step decline. The steel mills' demand for vanadium alloys increased significantly, so the price of ferrovandium began to rise slowly from the

end of April, and rose to the highest price of 110000-113000 Yuan/ton by acceptance with tax in the first half of 2020.

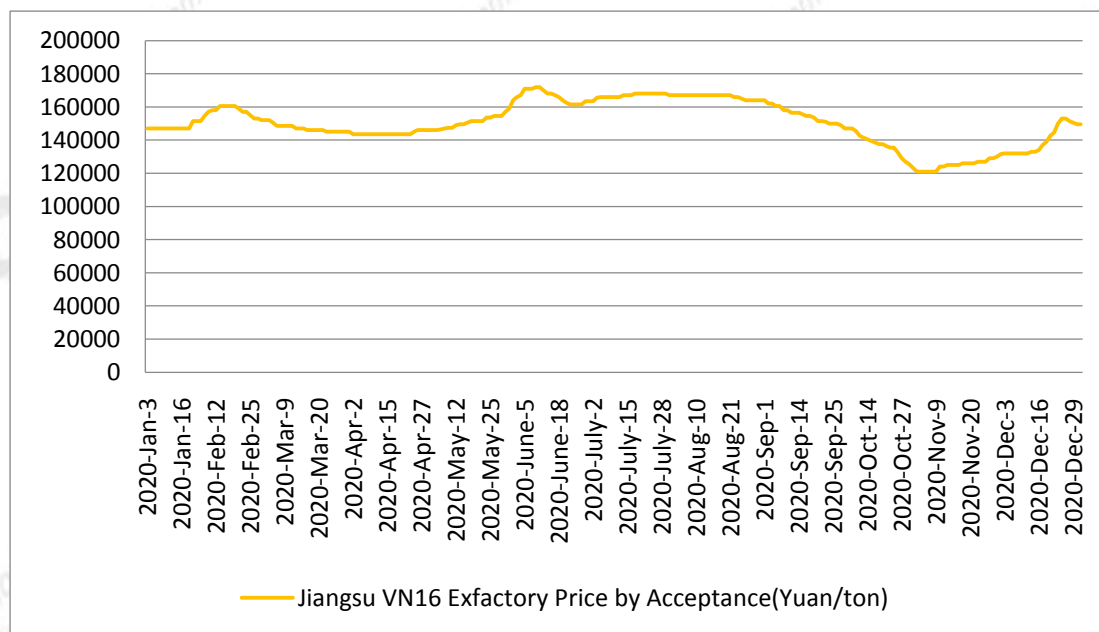
iii. FeV market review in the third quarter

In the third quarter, the market of ferrovanadium weakened as a whole. Although the demand for ferrovanadium in steel mills has been relatively stable in the second half of 2020, the supply of V₂O₅ flake exceeded the demand, and the import of ferrovanadium increased, which brought huge pressure to the domestic ferrovanadium market. The steel mills purchase ferrovanadium at a lower price. The ferrovanadium market was in a stalemate and tended to be weak. The price fell from 107000-109000 yuan / ton to 100000-101000 yuan / ton by acceptance with tax, down 7000-8000 yuan / ton.

iv. FeV market review in the fourth quarter

In the fourth quarter, the market of ferrovanadium was depressed first and then rose. In October, it took on the downward pressure in September. The continuous stimulation of imported V₂O₅ flake and ferrovanadium made the domestic price of ferrovanadium drop from 100000-101000 yuan / ton to 88000-89000 yuan / ton in early November. With the price rise of V₂O₅ flake in November, import ferrovanadium traders were reluctant to sell and low-price shipment reduced, the domestic ferrovanadium price has stopped falling and rebounded, following the price rise of V₂O₅ flake until the middle of December, and then dropped slightly.

Section IV Vanadium-nitrogen Alloy



i. VN alloy market review in the first quarter

In the first quarter, the VN alloy market rose as a whole. The procurement plan of steel plants after the festival, in the face of the epidemic policy of strict prevention and control, the vast majority of domestic roads and bridges were closed, the logistics cost doubled, so the spot price of VN alloy suddenly increased. However, Hubei Province was basically in a "sealed" state, the local VN alloy enterprises could not sell out of the province, thus the supply reduced, which led to the wave of price rise after the Spring Festival. At a small peak, the market price of VN alloy rose to more than 160000 yuan / ton by acceptance with tax. Later, due to the effective epidemic control, logistics was improved, and the inventory of steel plants was to be consumed, the price went down.

ii. VN alloy market review in the second quarter

Traditionally, the second quarter was the peak season of the steel market. From the end of April to the beginning of June, the price of rebar rose step by step. Although the inventory of steel products was still on the high side at this time, the exuberant demand can still stimulate the growth of steel output while consuming the steel inventory. Steel mills were more active in purchasing VN alloy, and the price has been rising steadily since the end of April. However, at the end of May and the beginning of June, the market began to rise too fast, traders hoarded goods, some manufacturers quoted excessively high prices, and the market cherished goods, which also led to the fact that spot goods began to be used for stocking rather than actual consumption. From the middle of June, the south of China officially entered the flood season, which seriously affected the demand of the steel market in the south. The inventory of rebar also ended the continuous decline for more than three months, and began to rebound, and the price also began to fall. Due to the excessive drop, the the V2O5 flake large factories started to support the market, thus the VN alloy manufacturers faced the risk of cost upside down, and began to unite to support the market price, which made the price of VN alloy go up slightly in the vanadium market at the end of June.

iii. VN alloy market review in the third quarter

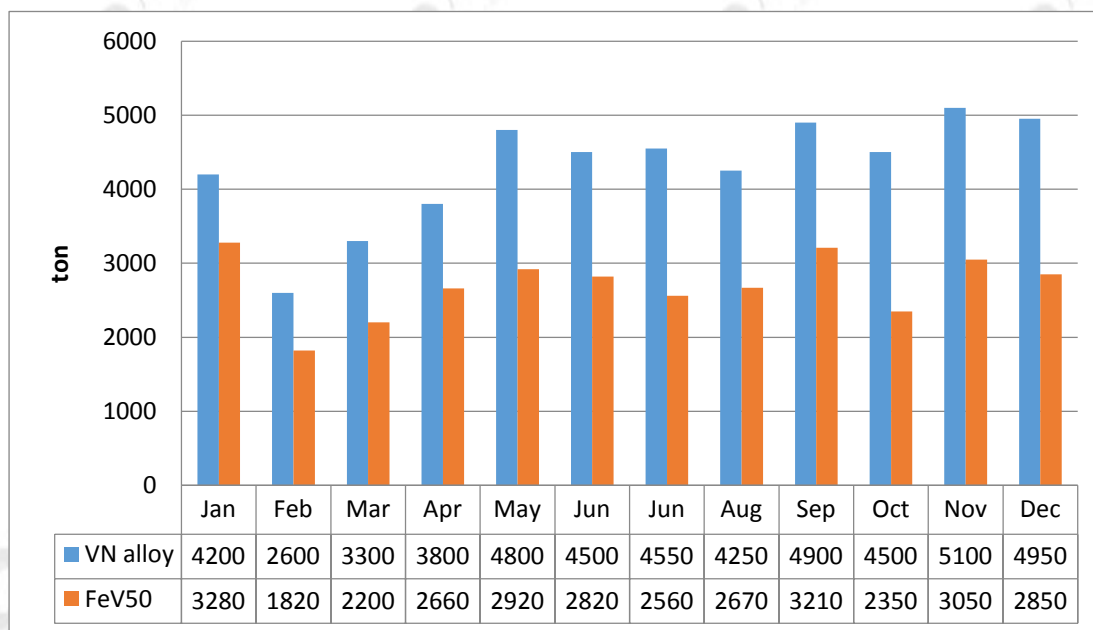
In July, supported by the price support of large V2O5 flake factories and terminal demand, the price of VN alloy barely stabilized, with a narrow range of about 165000-169000 yuan / ton by acceptance with tax. Since the end of August, with the increase of imported V2O5 flake, and the stable domestic production, the supply of V2O5 flake exceeded the demand, and then the transaction price has declined, and the bidding price of VN alloy has been falling. Under the market atmosphere of "buy up but not buy down", the operation of traders slowed down, the transaction of VN alloy retail market was not smooth, and the price was difficult to stabilize.

iv. VN alloy market review in the fourth quarter

Due to the high storage pressure of V2O5 flake in October, the price of VN alloy declined from 146000-148000 yuan / ton to 120000-122000 yuan / ton by acceptance with tax, with a decrease of nearly 26000 yuan / ton within one month. With the price of VN alloy entering the lowest level in 2020, the procurement of steel plants increased, the traders intended to hoard goods, the market inquiry increased, and the demand rose. In early November, the price of VN alloy stopped falling and rebounded, with slowly rising, and rose to 155000-158000 yuan / ton in mid December. At this time, the shipment of V2O5 flake and VN alloy increased, the market supply exceeded the demand, and the price of VN alloy dropped slightly in late December.

Chapter II Bidding Situation of Steel Mills in 2020

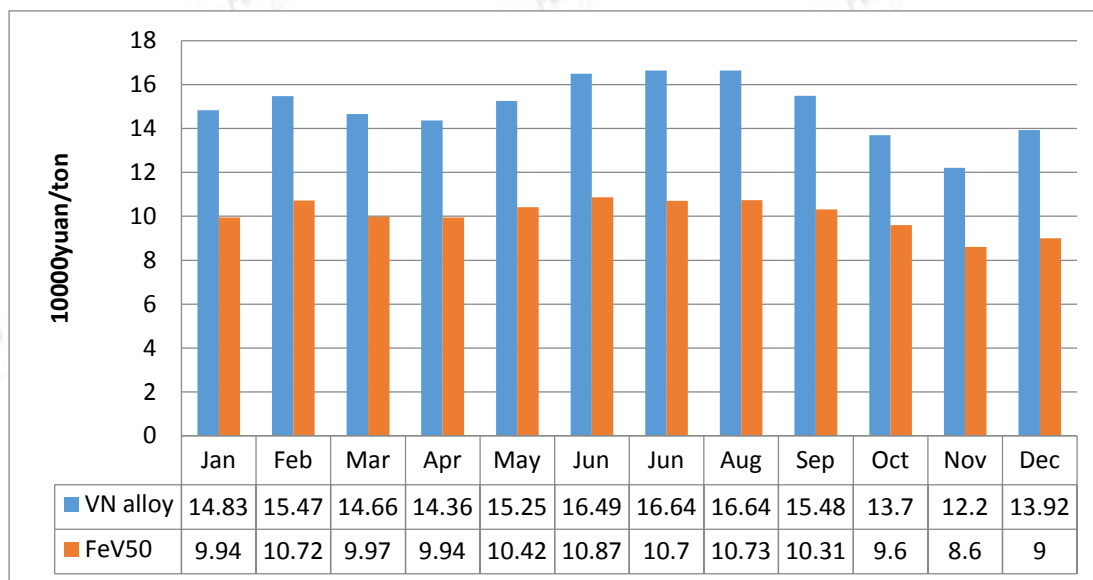
Section I Total Bidding Volume of FeV and VN Alloy in 2020(unit: ton)



According to the incomplete statistics, the above chart was the summary and comparison of the purchase volume of VN alloy and ferrovanadium of steel plants in 2020. On the whole, the purchase volume of vanadium alloy in steel plants showed an increasing trend. In February, the domestic epidemic broke out, the infrastructure was shut down, the steel plants reduced production, and the purchase volume of vanadium alloy decreased. In March, with the gradual control of the domestic epidemic, the infrastructure gradually returned to work and production, the stock of rebar was constantly consumed, and the purchase volume of steel plants was increasing. The monthly purchase volume of VN alloy gradually stabilized at 4200-4500 tons, and the monthly purchase volume of FeV50

was at 2600-2800 tons. From May to December, the purchasing volume was relatively stable, with little fluctuation. From November to December, it entered the stage of goods preparation before the Spring Festival, and the purchasing volume increased slightly.

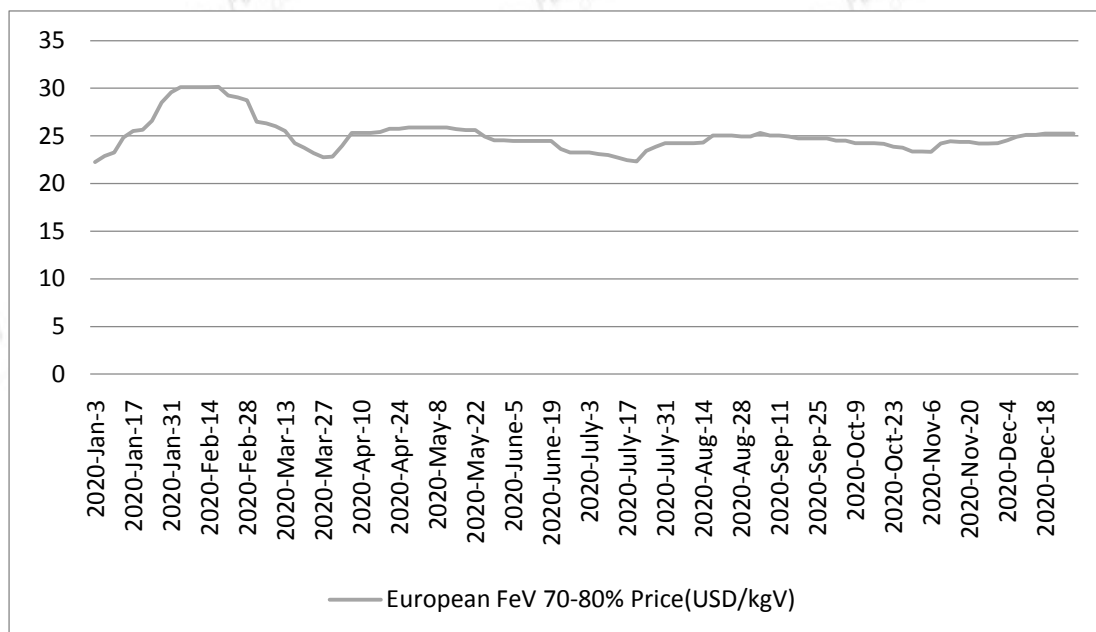
Section II Bidding Average Price of FeV and VN Alloy in 2019(unit: 10000 Yuan/ton)



It can be seen from the above data that the average purchase price of vanadium alloy of steel plants in 2020 showed a trend of rising first and then decreasing, which was synchronous with the price trend of domestic ferrovanadium and VN alloy. In the first half of 2020, the average purchase price of steel mills was relatively high. At the beginning of the year, the steel mills had a high enthusiasm for preparation before the festival. The purchase price of VN alloy increased from 148300 yuan / ton to 154700 yuan / ton, and the price of FeV50 increased slightly from 99400 yuan / ton to 107200 yuan / ton. Then, due to the outbreak of the domestic epidemic, the steel consumption slowed down, the purchase enthusiasm of vanadium alloy decreased, and the price fell in a short term. From April to June, with the domestic epidemic under good control, the resumption of work and production across the country continued to advance, the consumption of rebar stock increased, the procurement of steel plants increased, the demand for vanadium alloy improved, and the price showed an upward trend. From July to November, the import of vanadium products increased greatly. In addition, the domestic output was stable, and the supply of vanadium products exceeded the demand. The purchase price of steel plants kept breaking low, and it stopped falling and stabilized in November. When the price of vanadium products was low, traders started to build stocks. The manufacturers were reluctant to sell at low prices and large factories adjusted prices to support the market, which led to the rise of steel mills' purchasing price in December. The highest average purchase price of VN alloy was 166400 yuan / ton in July, and lowest price of 122000 yuan / ton in November; the highest average purchase price of FeV50 was 108700 yuan / ton in June, and lowest price of 86000 yuan / ton by acceptance with tax in November.

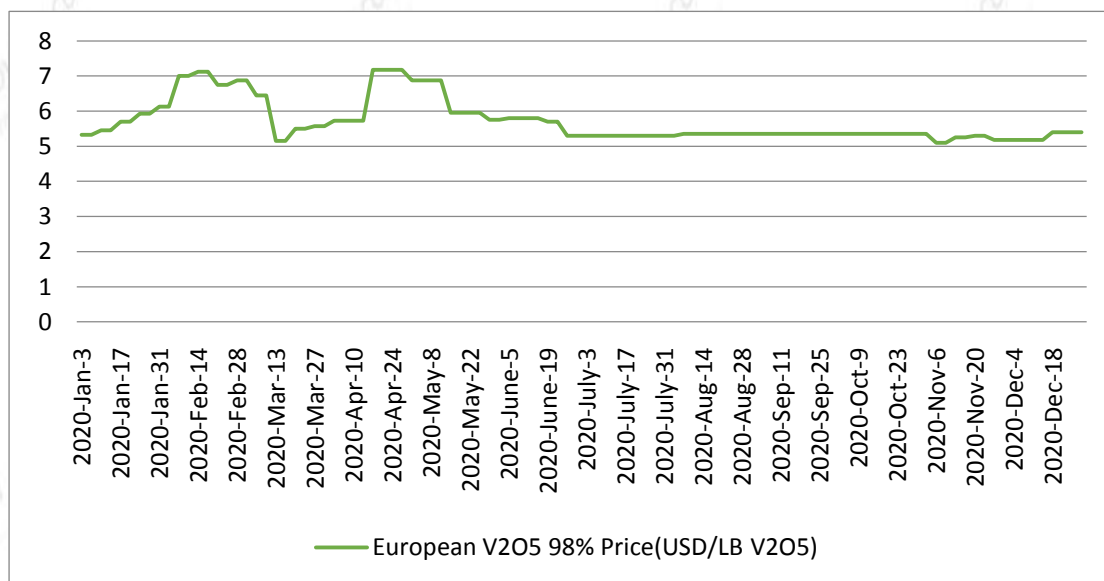
Chapter III Review of International Market Price in 2020

Section I Ferrovandium



In 2020, the price trend of FeV in Europe was strong first and then weak. In the first half of the year, it fluctuated greatly. At the beginning of the year, it rushed up from the lowest level to the highest level, and then rose slightly and fell slightly. The overall trend was weak. The lowest price in early January was 21.95 USD / kgV, and the highest price in late February was 30.8 USD / kgV. The annual average price was about 24.95 USD / kgV. In 2020, the price of FeV in Europe was lower than that in the domestic market. With the aggravation of foreign epidemic and the reduction of demand, the price of FeV in Europe continued to fall, the price gap between China and foreign countries continued to widen, and the number of imported FeV in the second half of the year increased greatly, which brought great pressure to the domestic market.

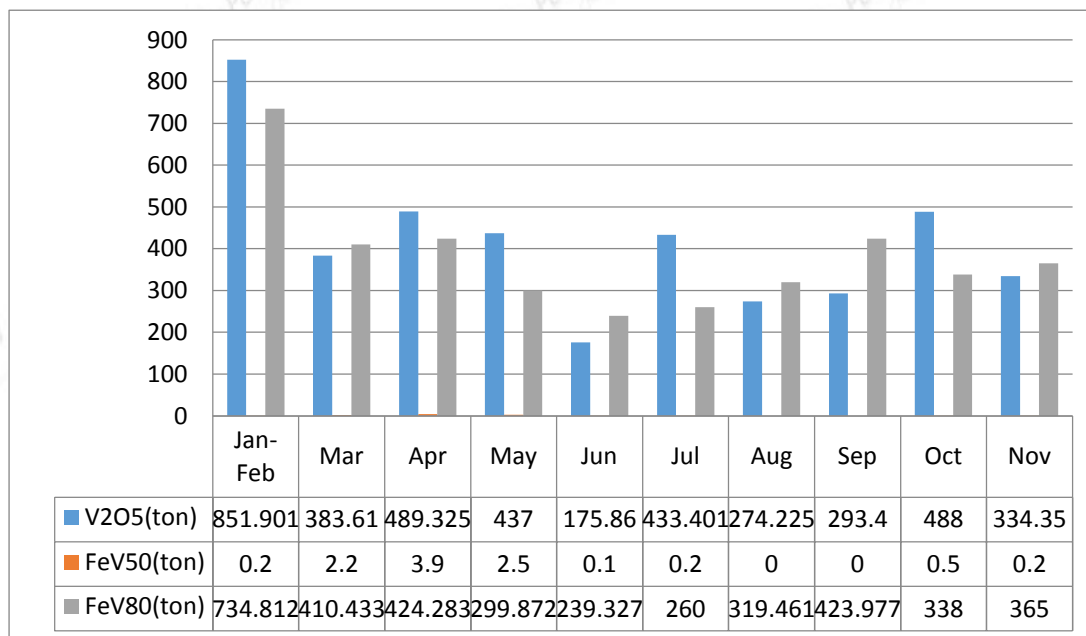
Section II V2O5



In the first half of 2020, the price of V2O5 in Europe was mixed, and the price was stable in the second half of 2020. In the first half of the year, European V2O5 was mainly affected by the domestic market, with two rounds of ups and downs. From January to February, the demand increased and the price went up. In March, the domestic epidemic broke out, the inquiry decreased greatly, and the price went down. In April, the domestic epidemic was gradually controlled, the domestic inquiry increased, and the price went up. In May, the foreign epidemic broke out, the foreign demand decreased greatly, and the production was normal, and the price fell and then remained low. In the middle of February, the annual highest price was 7.75 USD/lbV2O5, the duration of high price was short. Like ferrovanadium market, V2O5 market was in a relatively independent market at home and abroad in 2020. In June, at the domestic price rising stage, the low price of V2O5 in Europe hovered at 5.1-5.5 USD/lbV2O5, which continuously widened the price gap, promoted the increase of inquiries of domestic vanadium alloy plants and traders, and actively imported foreign V2O5. In the second half of 2020, the average monthly import volume was about 1200 tons, which was also one of the reasons for the decline of domestic vanadium price in the second half of 2020.

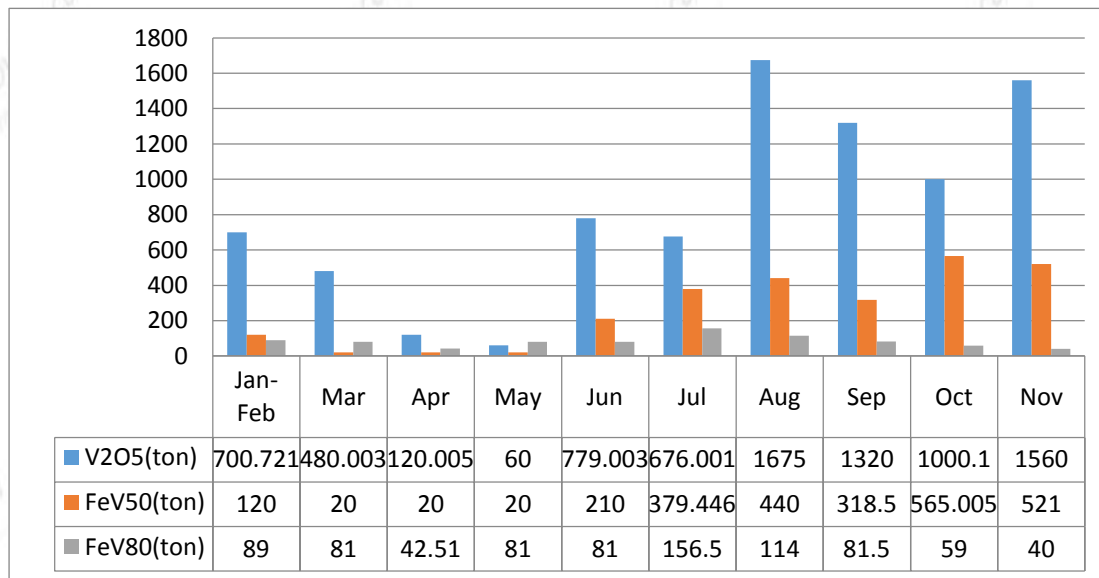
Chapter IV Review of International Market Imports and Exports in 2020

Section I Review of exports of vanadium products



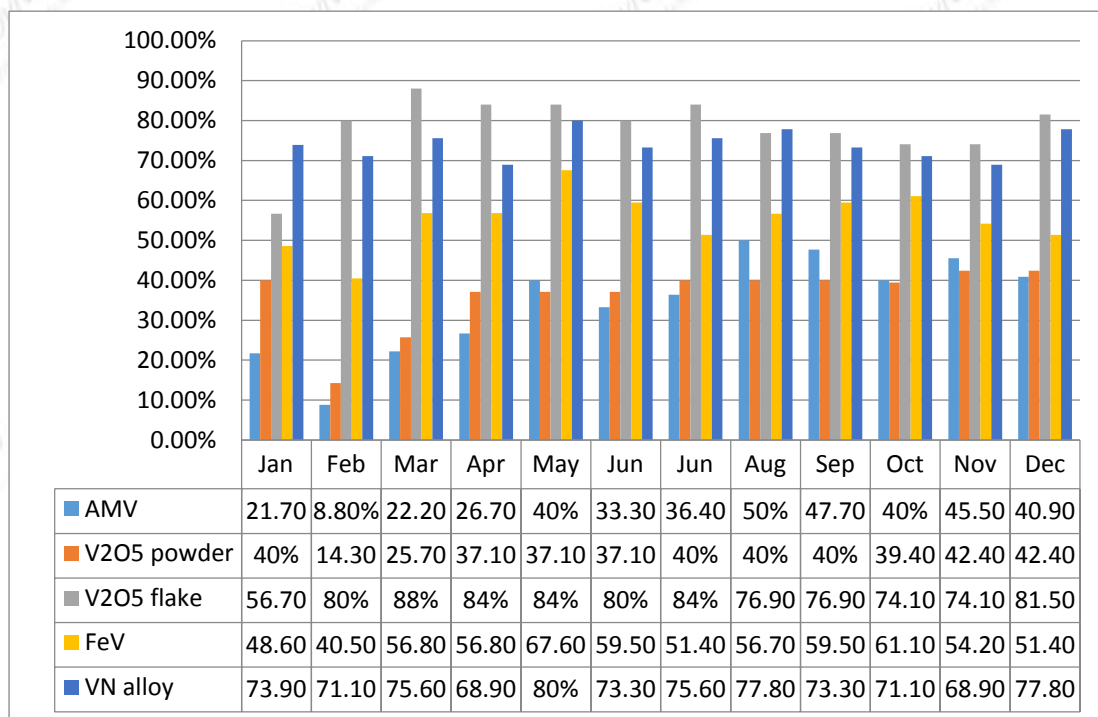
From the above figure, the export of vanadium products from January to November 2020 showed that domestic exports were mainly V2O5 and FeV80. As a whole, the export volume in the first half of 2020 was relatively stable, and the export volume showed a decreasing trend in the middle of the year, which was mainly due to the impact of the international epidemic and the reduction of demand for vanadium products in the international market. Some countries asked for delay in delivery and gradually returned to stability by the end of the year. According to the feedback of some import and export traders, there were few inquiries in the international market in 2020. In addition, the domestic price was higher than the international price, and the export was blocked, so it was difficult to have a real order.

Section II Review of imports of vanadium products



From the above figure, the import of vanadium products from January to November 2020 showed that domestic imports were mainly V2O5 and FeV 50, while the imports of FeV 80 were small. In 2020, the import volume of vanadium pentoxide increases gradually as a whole. In the first half of the year, as the price gap between domestic and foreign prices continued to widen, and the price gap was largest in the middle of June, and the domestic vanadium enterprises were active to inquiry. In August, the import volume of vanadium pentoxide reached the highest point. Then, with the decline of domestic vanadium price, the international price stabilized slightly, the price gap narrowed, and the import volume decreased, but the monthly average volume was still more than 1000 tons. The trend of import volume of FeV50 was similar to that of V2O5. The import volume increased in the whole year, with a significant increase in the second half year compared with the first half year.

Chapter V Operation Rate in 2020



It can be seen from the above figure that the fluctuation of the operating rate of vanadium products in 2020 was different, in which the operating rate of ammonium metavanadate first showed an upward trend, and then declined slightly; the operating rates of V2O5 powder and flaked and VN alloy were similar, with a small increase at the beginning of the year and then stable; the operating rate of ferrovanadium was low at the beginning of the year, and then increased and decreased with a small fluctuation. At the beginning of the year, affected by the sudden epidemic, the start-up of vanadium products was hindered, and the operating rate was relatively low throughout the year. With the good control of the domestic epidemic, the start-up of vanadium enterprises increased, and the operating rate gradually increased. In the second half of the year, the overall situation was relatively stable and the fluctuation was small. From October to November, affected by the continuous decline of vanadium price in China, due to the high cost of extracting vanadium from stone coal, the reverse production of manufacturers was serious, the number of manufacturers who stopped production increased, and the operation rate of ammonium metavanadate reduced; similarly, due to the large increase of imported resources, the price of V2O5 flake reduced, the production enthusiasm of manufacturers was also affected to a certain extent, and the operating rate was slightly reduced.

Chapter VI Prediction and Analysis in 2021

Section I Supply

According to the historical data, the domestic V₂O₅ flake production was increasing year by year, so it is expected that the overall V₂O₅ flake production will grow steadily in 2021; the imported vanadium products may become normalized, the price difference between domestic and foreign exists, and the imported resources will not stop, but the quantity may be more or less;

Section II Demand

The COVID-19 vaccine has been successfully developed, the foreign epidemic will gradually be effectively controlled, the international economy will continue to recover in 2021, the global market may gradually become synchronous, and the imported vanadium resources may be relatively reduced; according to the historical data, the domestic crude steel and rebar production will increase slightly in 2021, and the demand for vanadium alloys will naturally follow a small increase; the consumption of vanadium pentoxide into vanadium electrolyte in China in 2020 was about 5500 tons, with a year-on-year growth of 20-30%. It is expected that the vanadium consumption of vanadium electrolyte will double and exceed 10000 tons in 2021.

From the perspective of supply and demand, vanadium products will continue to face a series of challenges in 2021. At the same time, the market emergency and the adjustment of vanadium enterprises' mentality will affect the price fluctuation. On the whole, it is estimated that the price of vanadium in 2021 will not fluctuate much, and the price of V₂O₅ flake may be around 80000-150000 yuan / ton by cash with tax.