

Sodium Borohydride Market in China Edition (5)

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Kcomber Inc.

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Contents

LIST OF TABLES

- Table 2.2-1 Basic information of major producers of sodium borohydride in China, 2022
- Table 2.2.1-1 Capacity and output of major producers of sodium borohydride in China, 2018–2022
- Table 2.2.2-1 Competitiveness analysis of major sodium borohydride producers in China, 2022
- Table 3.2.1-1 Main end users of pharmaceuticals, 2022
- Table 3.2.1-2 Main end users
- Table 4.1-1 Main products of Shandong Guobang, as of May 2023
- Table 4.1-2 Capacity and output of sodium borohydride in Shandong Guobang, 2018–2022
- Table 4.2-1 Main products of Ningxia Best, as of May 2023
- Table 4.2-2 Main products of Ningxia Best, as of May 2023
- Table 4.2-3 Capacity and output of sodium borohydride in Ningxia Best, 2018–2022
- Table 4.3-1 Main products of Jiangsu Hongzi, as of May 2023
- Table 4.3-2 Capacity and output of sodium borohydride in Jiangsu Hongzi, 2018–2022

LIST OF FIGURES

- Figure 1.1-1 Competition situation of sodium borohydride industry in China, 2022
- Figure 2.1-1 Capacity and output of sodium borohydride in China, 2018–2022
- Figure 2.3-1 Ex-works prices of sodium borohydride, 2018–2022
- Figure 2.4-1 Flowchart of Brown-Schlesinger Process of sodium borohydride in China
- Figure 2.4-2 Flowchart of Bayer route of sodium borohydride production
- Figure 3.1-1 Apparent consumption volume of sodium borohydride in China, 2018–2022
- Figure 3.1-2 Consumption pattern of sodium borohydride in China, 2022
- Figure 3.2.1-1 Consumption share of sodium borohydride in pharmaceutical industry by product category in China, 2022
- Figure 3.2.1-2 Value and growth rate of pharmaceutical industry in China, 2018–2022
- Figure 3.2.2-1 Consumption share of sodium borohydride in agrochemical industry by product in China, 2022
- Figure 3.2.2-2 Output of pesticide technical in China, 2018–2022

Executive summary

In 2022, the production capacity of sodium borohydride increased significantly from 5,500 t/a in 2021 to 7,000 t/a in 2022. At the same time, Shandong Guobang Pharmaceutical Co., Ltd. still has 6,000 t/a solid sodium borohydride and 40,000 t/a liquid sodium borohydride under construction, in the view of sodium borohydride being as one of the ingredients of COVID-19 drugs. However, the epidemic situation has undergone a rapid change, which may lead to excessive capacity and oversupply for the current and future surge in production capacity of sodium borohydride.

In 2018–2022, the annual ex-works price of sodium borohydride dipped from USD22,695/t (RMB156,000/t) to USD21,881/t (RMB152,000/t). Affected by the COVID-19 and the rising downstream demand, the annual price of sodium borohydride saw a increase in 2019–2021

At present, all manufacturers have been using the Brown-Schlesinger Process in China.

As a selective reducing agent, sodium borohydride is mainly used in pharmaceutical and agrochemical industries, and these two fields accounted for 90% of the total consumption in 2022, especially the pharmaceutical industry. And it is predicted that the consumption of domestic sodium borohydride will not change significantly in the next three years

Sodium borohydride is threatened by some substitutes, especially potassium borohydride, which has almost the same properties but at a lower price. Although there are some producers in downstream industries turning to potassium borohydride, it has not yet fully replaced sodium borohydride.

Methodology and definition

Introduction

This is the sixth edition report on China's sodium borohydride industry finished by CCM in June 2023. It attaches great importance to the following parts:

- Updating the information of sodium borohydride industry in China in the past years, including supply, price and demand;
- Identifying key producers and potential producers of sodium borohydride in China;
- Showing the market demand by volume of sodium borohydride during 2018–2022, as well as its consumption structure by applications;
- Figuring out the development status and influencing factors of the sodium borohydride industry in China;
- Exploring commercial opportunities of the sodium borohydride industry in China.

Methodology

The report is based on data sourced by diverse methods, as follows:

- Desk research

Desk research includes access to published magazines, journals, government statistics, industry statistics, customs statistics, association seminars as well as information on the Internet. Much work has gone into the compilation and analysis of the information obtained. Where necessary, information has been checked with Chinese sodium borohydride participants regarding intelligence related to market structure and performance characteristics as key producers, key end users, production levels, end user demand and so on.

- Survey

CCM has conducted an extensive survey using telephone interviews in order to study the market of sodium borohydride in China.

The interviewees included the following groups:

- Key producers
- Key end users
- Associations involved
- Industry experts

- Data processing and presentation

The data collected and compiled was variously sourced from:

- CCM's database
- Statistics from governments and international institutes
- Telephone interviews with domestic producers, service suppliers and government agencies
- Third-party data
- Comments from industrial experts
- Information from the Internet

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

Definition

There are two types of sodium borohydride in China: liquid and solid ones. Liquid sodium borohydride is an intermediate product and is mainly used as a raw material for the production of solid sodium borohydride. The consumption for liquid sodium borohydride is very small in China because of its inconvenience of transportation.

The solid sodium borohydride ($\geq 98\%$) can be divided into powder type and granule type in China. There's no distinction made between them. Most producers make powdered sodium borohydride. The two types have the same consumption fields and the prices are similar.

Abbreviation

- t: tonne
- g: gram
- t/a: tonne/annual
- USD: currency unit in the US
- RMB: currency unit in China, also named yuan
- CAGR: Compound Annual Growth Rate
- m²: square meter

Table null-1 Exchange rate USD/CNY, Jan. 2018–Dec. 2022

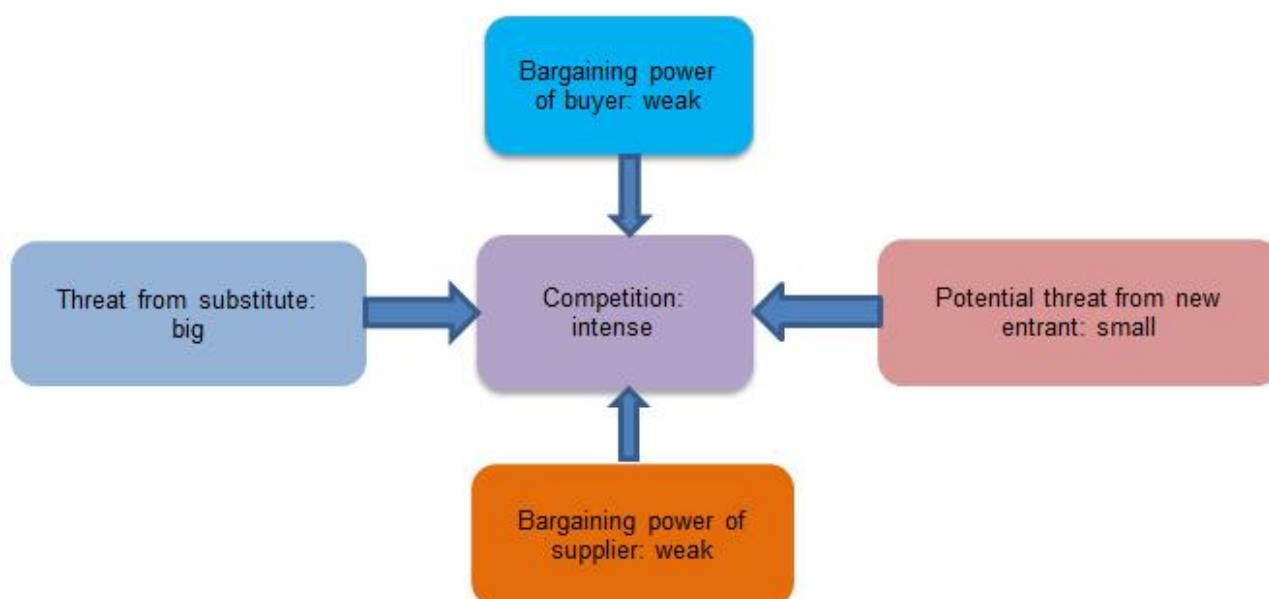
Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
2018	6.5079	6.3045	6.3352	6.2764	6.3670	6.4078	6.6157	6.8293	6.8347	6.8957	6.9670	6.9431	6.6070
2019	6.8482	6.7081	6.6957	6.7193	6.7344	6.8896	6.8716	6.8938	7.0883	7.0726	7.0437	7.0262	6.8826
2020	6.9614	6.9249	6.9811	7.0771	7.0690	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	6.8821	7.0992	7.2081	7.1225	6.6972

Source: The People's Bank of China

1 Key findings and market dynamics

1.1 Key findings

Figure 1.1-1 Competition situation of sodium borohydride industry in China, 2022



Source:CCM

Each case is explained as follows:

- Bargaining power of suppliers is weak.
 - The main raw materials for the production of sodium borohydride are sodium, hydrogen, methanol and boric acid. These materials are relatively abundant in China, and the demand from sodium borohydride manufacturers only accounts for a small part of the total consumption of these raw materials.
- Bargaining power of buyers is weak.
 - Firstly, there were about three active sodium borohydride producers in China in 2022. These three manufacturers have great pricing power in the sodium borohydride market and offer relatively low market prices. It's hard for customers to easily change their suppliers.
 - Secondly, the production cost is still high, and the feasibility for downstream customers to push the price of sodium borohydride lower is very small.
- Potential threat from new entrant is small.
 - Due to the particularities of sodium borohydride production equipment and increasing environmental protection requirements, the industry demands manufacturers have sufficient capital and invest more in environmental protection. Therefore, the entry barrier for new comer is relatively high.
- Threat from substitutes is big.
 - In China, sodium borohydride is mainly used as a reducing agent for pharmaceuticals & pesticides and their intermediates. It can be replaced by many substitutes, especially potassium borohydride. The synthetic route of potassium borohydride is the same as sodium borohydride, but the price of potassium borohydride is lower than sodium borohydride.
- Competition is intense.
 - Overcapacity: In 2022, the capacity of sodium borohydride was about 7,000 t/a, and there will be new production capacity come into the market in the next three years.
 - Normal domestic demand: In recent years, the pandemic in 2021 caused the sudden increase in consumption. there was no significant changes in other years
 - Similar product quality: During 2018–2022, the production technology did not advance significantly. As a result, the products supplied by different producers were almost the same in China. (先 supply side 再 demand side)
 - Homogeneous product supply: During 2018–2022, there were not significant advance in the sodium borohydride production technology and therefore the products supplied by different producers were

almost the same in China.

- Normal domestic demand: During 2018–2022, the market demand was rather stable, excluding the sudden increase in consumption during the pandemic period in 2021.

In view of the current competition situation, manufacturers can grow obtain and maintain their own competitive advantages through advances in technology and branding influence expansion(很少有这种说法), so as to stand out in the market.

- In terms of technology, boost research and development efforts, improve and optimize production processes to increase the yield of products and save production cost. In recent years, there has been no further breakthrough in the synthesis of sodium borohydride. But there is a great potential for technological improvement.
- In terms of branding, manufacturers can provide differentiated services to customers. For example, improving the convenience of ordering channels, shortening the delivery time and providing after-sales consulting and other services.

1.2 Market dynamics

With optimizing of sodium borohydride industry, strengthening of environmental protection measures in China and the chemical accident happened in 2019, three sodium borohydride producers suspended their production lines.

In 2018–2022, the production capacity of sodium borohydride was first cut down decreased and then increased. In 2019, three sodium borohydride producers stopped/removed their production lines due to severe chemical accidents happened, the consequent optimization of the sodium borohydride industry and tightening measures for environmental protection. In 2022, one producer (Ningxia Best Pharmaceutical Chemical Co., Ltd.) put added capacity on stream. In 2019, due to environmental policy tightening on several chemical explosion instances in early 2019, three producers stopped/removed their production lines. From 2019 to 202 induced by the COVID-19 epidemic, the output of sodium borohydride, one of the ingredients for producing specific drugs, saw an increase. (第一段将 capacity, 第二段说 consumption, 怎么混在一起。)

Except for 2021, there was no significant change in domestic consumption of sodium borohydride. Induced by the aggravated COVID-19 epidemic in 2021,, the consumption of sodium borohydride, one of the specific drug ingredients, recorded a significant increase. However, in 2022, the epidemic situation changed, causing the domestic consumption of sodium borohydride returned to its former shape in 2022.

During the five years, there was no significant change in domestic consumption of sodium borohydride. However, in 2021, the overall output of sodium borohydride soared, thanks to its properties of ingredient for drugs for COVID-19. In 2022, as the epidemic subsided, the domestic consumption of sodium borohydride fell back to the previous level.

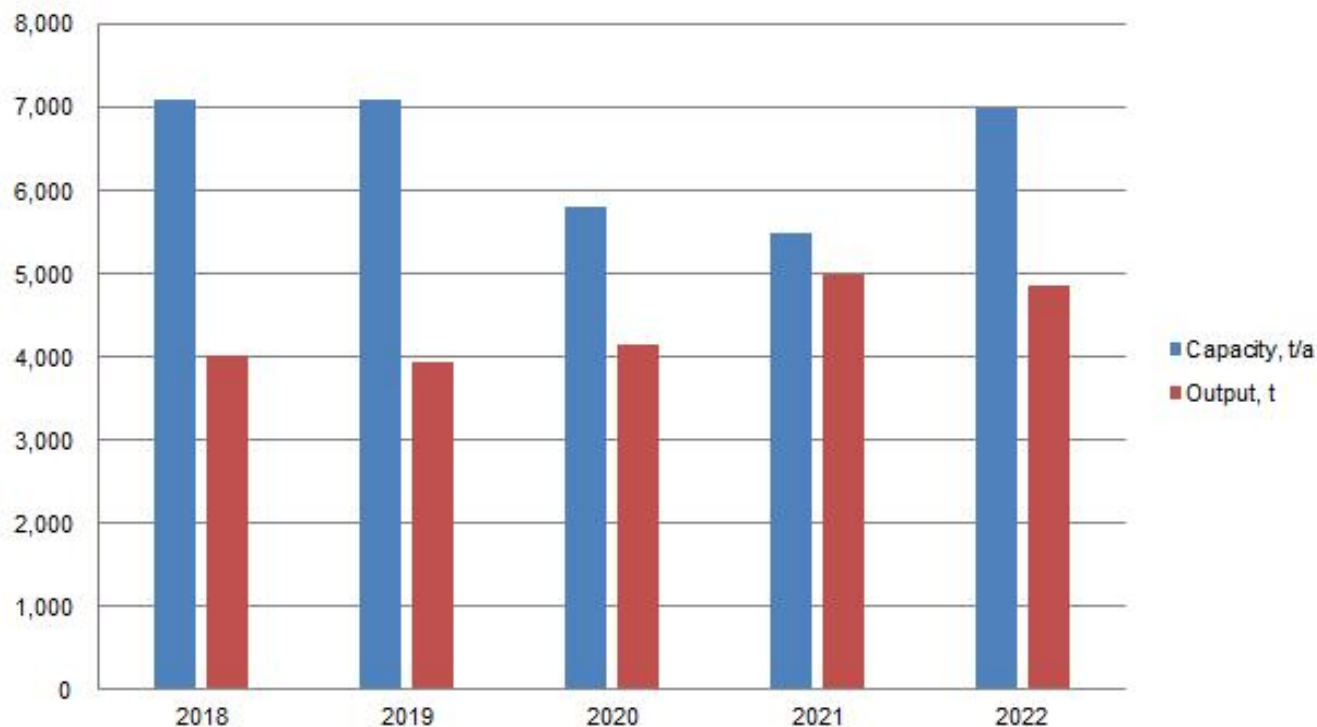
Currently, there is no key policy or regulation for production and consumption of sodium borohydride.

2 Production

2.1 Capacity and output, 2018–2022

China's sodium borohydride production capacity fell from 7,100 t/a in 2018 to 7,000 t/a in 2022, at a CAGR of -0.35% in 2018–2022. However, the output went up from 4,020 tonnes in 2018 to 4,850 tonnes in 2022, at a CAGR of 4.80% in 2018–2022.

Figure 2.1-1 Capacity and output of sodium borohydride in China, 2018–2022



Source:CCM

The overall production of sodium borohydride showed a fluctuating increase from 2018 to 2022. From 2018 to 2019, the output of sodium borohydride decreased, mainly due to several chemical accidents that had occurred in Jiangsu Province in 2019, causing to the closure of some chemical parks and stricter policies oriented toward the sodium borohydride production.

From 2019 to 2021, induced by the COVID-19 epidemic, the output of sodium borohydride, one of the ingredients for producing specific drugs, saw an increase. With the continuation of COVID-19 epidemic, the output of sodium borohydride also released to a certain extent.

In the year of 2022 when the epidemic eased, the production of sodium borohydride witnessed a slight decline.

2.2 Producer

In 2022, there were three

active sodium borohydride producers located in Shandong Province, Jiangsu Province and Ningxia Hui Autonomous Region, respectively.

Table 2.2-1 Basic information of major producers of sodium borohydride in China, 2022

No.	Producer	Abbreviation	Location	Status, 2022	Year of establishment	Registered capital, million RMB
1	Shandong Guobang Pharmaceutical Co., Ltd.	Shandong Guobang	Shandong	Active	2006	104,730,000
2	Ningxia Best Pharmaceutical Chemical Co., Ltd.	Ningxia Best	Ningxia	Active	2014	100,000,000
3	Jiangsu Hongzi New Energy Science & Technology Co., Ltd.	Jiangsu Hongzi	Jiangsu	Active	2006	40,000,000

Source:CCM

2.2.1 Production situation, 2018–2022

In general, the concentration of sodium borohydride industry is relatively high in China. As of 2022, there were only three manufacturers including Shandong Guobang Pharmaceutical Co., Ltd. (Shandong Guobang) accounted for over 50% of the total production capacity.

As of 2022, there were only three manufacturers producing sodium borohydride in China, among which Shandong Guobang Pharmaceutical Co., Ltd. (Shandong Guobang) accounted for over 50% of the total capacity.

In 2018–2020, a total of one new expansion project and three production lines were stopped. Affected by the continuous occurrence of chemical safety accidents in early 2019, some chemical producers, including Jiangsu Huachang Chemical Co., Ltd., Rugao Chemical Reagent Factory Co., Ltd. and Jiangsu Zhaoyang Chemical Co., Ltd., the three Jiangsu-based enterprises, was suspended the production of sodium borohydride for rectification and implementing stricter policies. Therefore, the production capacity was slashed by 1,300t/a

. In 2018–2020, a total of 1,300 t/a sodium borohydride capacity of the three Jiangsu-based enterprises—Jiangsu Huachang Chemical Co., Ltd., Rugao Chemical Reagent Factory Co., Ltd. and Jiangsu Zhaoyang Chemical Co., Ltd.—was stopped/removed, largely due to environmental policy tightening on several chemical explosion instances in early 2019.

In 2022, Ningxia Best Pharmaceutical Chemical Co., Ltd.'s 1,500 t/a sodium borohydride production line was put into production. raising its total production capacity to 2,500 t/a.

Currently, there are three potential projects:

—Shandong Guobang Pharmaceutical Co., Ltd.'s 6,000 t/a solid sodium borohydride and 40,000 t/a liquid sodium borohydride under construction.

—Ningxia Best Pharmaceutical Chemical Co., Ltd.'s 2,000 t/a sodium borohydride designed to start production in H2 2023.

—Liaoning Dongxiang Chemical Technology Co., Ltd. (Dongxiang Chemical)'s 400 t/a sodium borohydride, designed to start production in late 2023.

Table 2.2.1-1 Capacity and output of major producers of sodium borohydride in China, 2018–2022

No.	Producer	Status, 2022	Capacity, t/a					Output, tonne				
			2022	2021	2020	2019	2018	2022	2021	2020	2019	2018
1	Shandong Guobang Pharmaceutical Co., Ltd.	Active	4,000	4,000	4,000	4,000	4,000	3,700	3,800	3,100	2,600	2,700
2	Ningxia Best Pharmaceutical Chemical Co., Ltd.	Active	2,500	1,000	1,000	1,000	1,000	800	800	600	350	400
3	Jiangsu Hongzi New Energy Science & Technology Co., Ltd.	Active	500	500	500	500	500	350	400	350	300	100
4	Jiangsu Huachang Chemical Co., Ltd.	Removal	0	0	0	1000	1000	0	0	0	450	500
5	Rugao Chemical Reagent Factory Co., Ltd.	Stopped	0	0	0	200	200	0	0	0	80	100
6	Jiangsu Zhaoyang Chemical Co., Ltd.	Stopped	0	0	0	100	100	0	0	0	50	70
Total			7,000	5,500	5,500	6,800	6,800	4,850	5,000	4,050	3,830	3,870

Source:CCM

2.2.2 Competition analysis

Cost performance is the most important factor in deciding producers' market share. Product quality, market price, supply capability and brand awareness are secondary factors that influence end-users' choice.

For sodium borohydride producers and distribution channel are also important indicators of competitiveness.

Table 2.2.2-1 Competitiveness analysis of major sodium borohydride producers in China, 2022

Item	Shandong Guobang	Ningxia Best	Jiangsu Hongzi
Cost performance	3	2	1
Product quality	3	2	2
Market price	4	3	2
Supply capability	4	3	1
Brand awareness	4	2	2
Production cost	4	3	2
Distribution channel	4	2	1
Total	26	17	119

Note: The level of competitiveness is marked by "1", "2", "3" and "4". "4" stands for the highest and "1" for the lowest.
Source: CCM

- Shandong Guobang is a subsidiary of Guobang Pharmaceutical Group Co., Ltd. Supported by abundant funding, the company's product is the most competitive in China, and is popular in the market. Boasting the largest production capacity in China and lower market price, Shandong Guobang's output and sales volume of sodium borohydride rank first. It also has advantages in export, as its sales network covers European and American markets. Also, the company follows lean manufacturing methods, which helps it strengthen its competitiveness. At the same time, the company also has an expansion project with designed capacity of 6,000 t/a solid sodium borohydride and 40,000 t/a liquid sodium borohydride, which is under construction.

- Ningxia Best adopts advanced production technology, and its production process adopts Distributed Control System (DCS) to ensure the consistency of product quality. In terms of product research and development, Ningxia Best has established a pharmaceutical and chemical joint research center on products and production processes. Meanwhile, it cooperates with Ningxia University to develop a new technology for continuous extraction of sodium borohydride. Beside, Ningxia Best is located in coal-rich Ningxia, and it has a comparative advantage in power cost. The company has an expansion project with designed capacity of 2,000 t/a sodium borohydride, which is under construction.

2.3 Price analysis

In 2018–2020, the annual price dipped from USD22,885/t (RMB156,000/t) to USD21,881/t (RMB152,000/t), due to weakened downstream demand. The main reasons were as follows:

- With capacity expansion, the supply of sodium borohydride in the market was sufficient. (capacity 在 2018-2020 的时候是下降了!)
- Downstream demand weakened.

In 2018–2020, the annual price (in RMB) saw a slight fluctuation, raised from RMB151,200/t to RMB151,600/t with a rise in 2019 due to a decrease in output. (However, given the RMB/USD exchange factor, the price in USD showed a general decline from USD22,885/t to USD21,881/t.)

In 2022, the annual price was USD29,863/t (RMB200,000/t), up 7% year on year, after a 30% year-on-year rise in 2021, which were boosted by the surging downstream demand for the treatments for COVID-19.

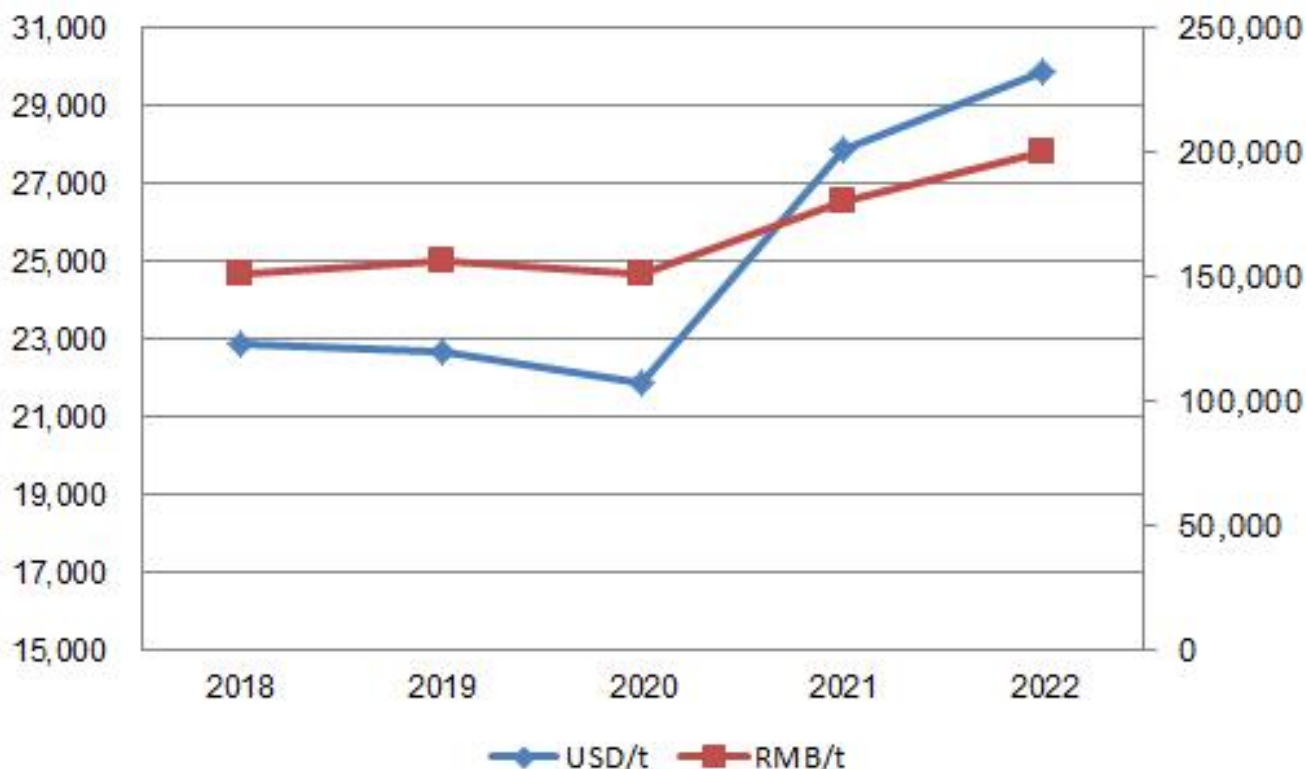
In 2022, the annual price increased to USD29,863/t (RMB200,000/t), especially in 2021, the price increased nearly 30% comparing to 2020. The main reasons were as follows:

(下面的理由应该是 2021/2022 价格持续上涨的原因)

- The supply capacity of sodium borohydride decreased (capacity 在 2021/2022 是上升, supply 对比前几年来说, 也是处于较高水平的。。。所以论据不成立): In 2019, several chemical accidents occurred in Jiangsu Provin ccausedthe closure of chemical parks, and local governments issued stricter policies oriented toward the sodium borohydride production. Besides, the COVID-19 epidemic also affected to the normal production of many factories.
- The downstream demand strengthened: As one of the ingredient for producing specific drugs for the COVID-19 epidemic, the downstream demand of sodium borohydride also increased.

- (合并到上面)

Figure 2.3-1 Ex-works prices of sodium borohydride, 2018–2022



Note: Given the RMB/USD exchange factor, the prices in RMB and USD from 2018 to 2020 moved different directions.
Source: CCM

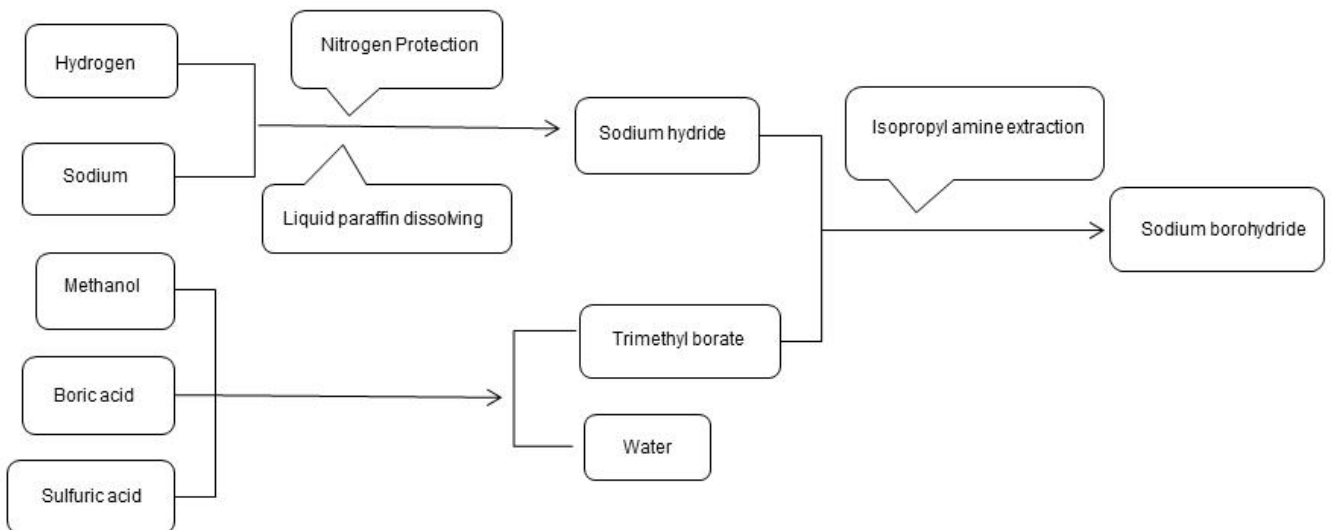
2.4 Technology

There are many sodium borohydride production methods, which include Brown-Schlesinger Process, Bayer Process, electrolysis route, direct reduction route, mechanical-chemical reduction route, microwave route and so on.

The Brown-Schlesinger Process and Bayer Process can realize mass production and guarantee the output. Therefore, these two routes are the most commonly used methods in producing sodium borohydride. According to CCM investigation, all manufacturers use the Brown-Schlesinger Process in China. Brown-Schlesinger Process uses sodium hydride and trimethyl borate as raw materials, and the production temperature usually falls in the range of 225°C–270°C.

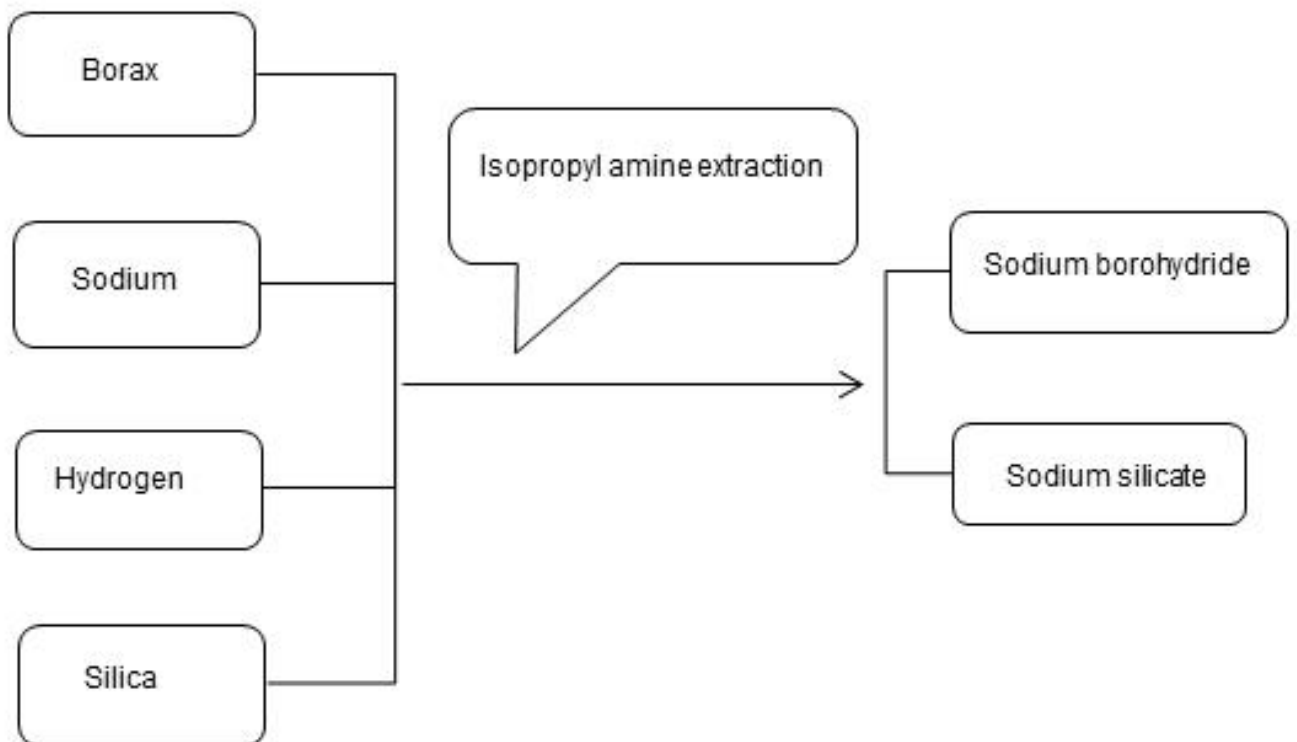
The raw materials of the Bayer Process are borax, sodium, hydrogen, and silica. Since the reaction temperature of the production process is as high as 700°C and high-pressure hydrogen is required, this route has high requirements for production equipment, consumes larger energy, and sees greater production cost. However, the Bayer route generates little waste.

Figure 2.4-1 Flowchart of Brown-Schlesinger Process of sodium borohydride in China



Source:CCM

Figure 2.4-2 Flowchart of Bayer route of sodium borohydride production



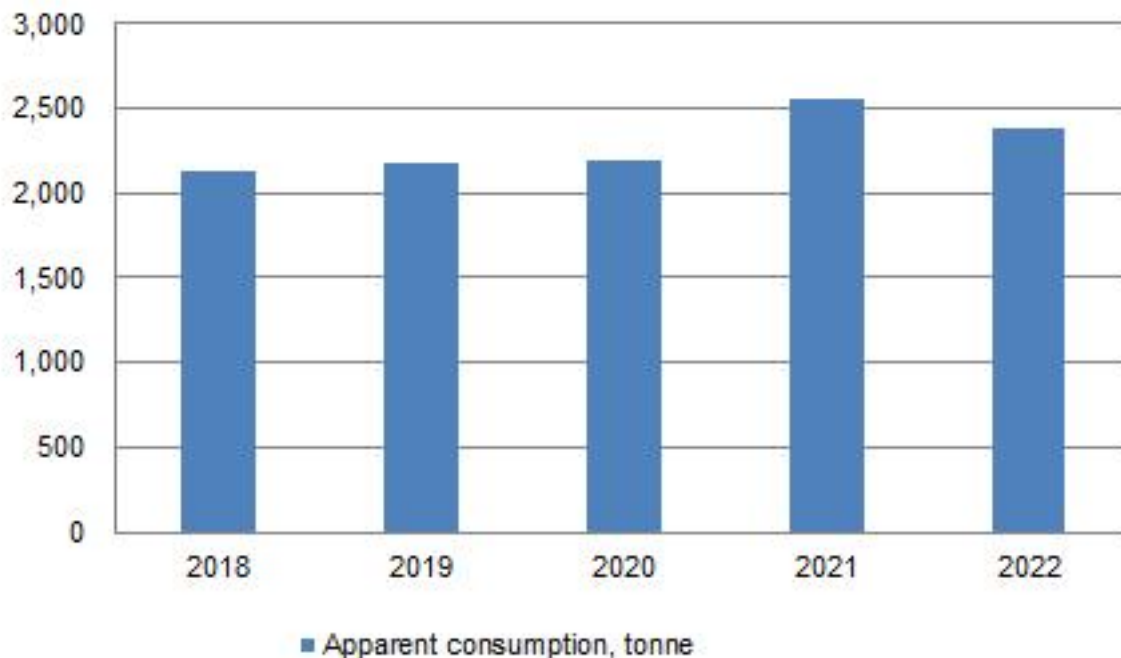
Source:CCM

3 Consumption

3.1 Overview, 2018–2022

China's consumption volume of sodium borohydride had been growing from from 2,130 tonnes in 2018 to 2,560 tonnes in 2021, and reduced to 2,380 tonnes in 2022.

Figure 3.1-1 Apparent consumption volume of sodium borohydride in China, 2018–2022



Source:CCM

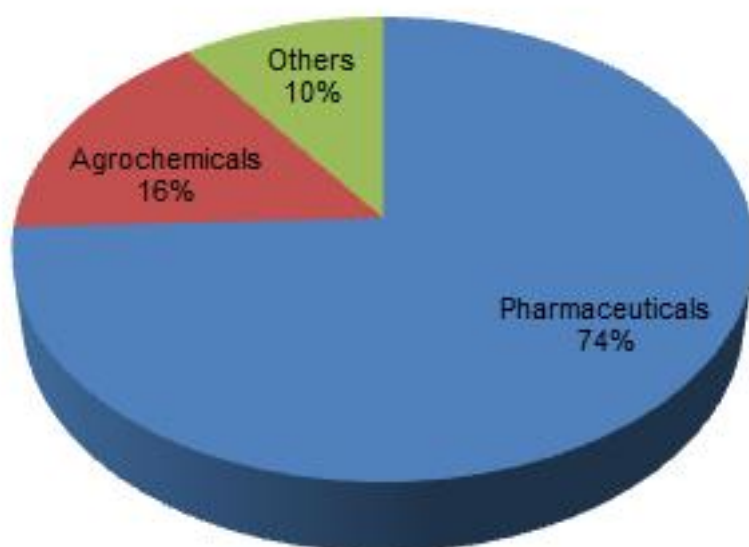
As a reducing agent, sodium borohydride is mainly used in the synthesis of high-priced pharmaceuticals, agrochemicals, intermediates as well as other fine chemicals in China.

Except for 2021, there was no significant change in domestic consumption of sodium borohydride. In 2021, affected by the aggravated COVID-19 epidemic, the consumption of sodium borohydride, one of the specific drug ingredients, saw a significant increase. However, in 2022, the epidemic situation changed, causing the domestic consumption of sodium borohydride returned to its former shape in 2022.

Over the past five years, there were no significant changes in the country's consumption of sodium borohydride, except for 2021 when sodium borohydride was in surging demand for the production of treatments for COVID-19. However, in 2022, the epidemic eased and the consumption returned to the previous level.

It is expected that the consumption of sodium borohydride in China will stay at the current level in the next three years.

Figure 3.1-2 Consumption pattern of sodium borohydride in China, 2022



Source:CCM

In 2022, the consumption of sodium borohydride in pharmaceuticals accounted for 74% of the total, followed by agrochemicals, accounting for 16%.

3.2 Downstream industries

3.2.1 Pharmaceuticals

Pharmaceutical industry is the largest downstream industry of sodium borohydride in China. In 2022, the consumption in pharmaceutical sector was about 1,770 tonnes. There are many downstream products of sodium borohydride, including antibiotics, antidepressants, muscle relaxants, etc.

Antibiotics: Dihydronebena streptomycin Dihydrostreptomycin and chloramphenicol

Antidepressants: Duloxetine hydrochloride, Votigetinemirtazapine

Muscle relaxants: Rocuronium bromide, pipecuronium bromide

Table 3.2.1-1 Main end users of pharmaceuticals, 2022

Category	Product	End users		
		1	2	3
Antibiotics	Dihydrostreptomycin	North China Pharmaceutical Huasheng Co., Ltd.	Alta Scientific Ltd.	/
	Chloramphenicol	Northeast Pharmaceutical Group Co., Ltd.	Nanjing Jinling Pharmaceutical Factory of Jinling Pharmaceutical Co., Ltd.	Sangon Biotech (Shanghai) Co., Ltd.
Antidepressants	Duloxetine hydrochloride	Shanghai Pharmaceuticals Holding Co., Ltd.	Shanghai Wonder Pharmaceutical Co., Ltd.	YaoPharma Co., Ltd.
	Mirtazapine	Shanxi Kangbao Biological Product Co., Ltd.	Huayu (Wuxi) Pharmaceutical Co., Ltd.	Harbin Medisan Pharmaceutical Co., Ltd.
Muscle relaxants	Rocuronium bromide	Zhejiang Huahai Pharmaceutical Co., Ltd.	Zhejiang Xianju Pharmaceutical Co., Ltd.	/
	Pipecuronium bromide	Sichuan Credit Pharmaceutical Co., Ltd.	/	/

Source:CCM

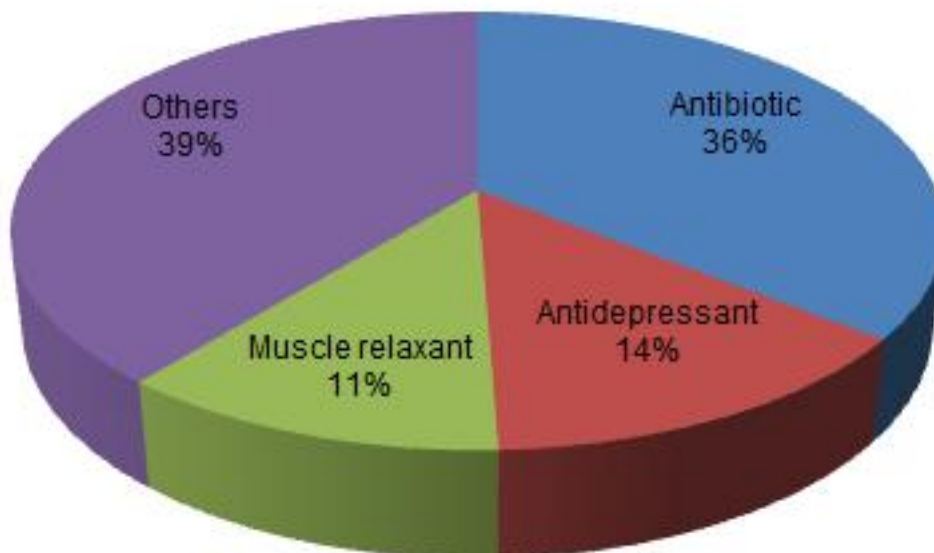
Table 3.2.1-2 Main end users

Antibiotics	Dihydronebena streptomycin Dihydrostreptomycin	North China Pharmaceutical Huasheng Co.,Ltd.	Alta Scientific Ltd.	
	Chloramphenicol	Northeast Pharmaceutical Group Co.,Ltd.	Jinling Pharmaceutical Co., Ltd. Nanjing Jinling Pharmaceutical Factory	Sangon Biotech(Shanghai)Co.,Ltd.
Antidepressants	Duloxetine Hydrochloride	Shanghai Pharmaceuticals Holding Co.,Ltd.	Shanghai Wonder Pharmaceutical Co., Ltd.	Chongqing Yaoyou Pharmaceutical Co., Ltd.
	Mirtazapine	Shanxi Kangbao Biological Product Co.,Ltd.	Huayu(Wuxi)Pharmaceutical Co.,Ltd.	Harbin Sanlian Pharmaceutical Co.,Ltd.
Muscle relaxants	Rocuronium bromide	Huahai Pharmaceutical Co.,Ltd.	Zhejiang Xianju Pharmaceutical Co.,Ltd.	
	Pipecuronium bromide	Sichuan Credit Pharmaceutical Co.,Ltd.		

Source:CCM

Consumption of sodium borohydride in the pharmaceutical industry showed an upward trend in 2018–2022. In this period, the overall output of antibiotics in China tended to be stable, while the output of antidepressants and muscle relaxants witnessed an increase. It is worth noting that sodium borohydride is one of the ingredients for producing specific drugs of COVID-19. During 2020–2021, the consumption of the pharmaceutical industry increased significantly, and the consumption in 2021 increased by nearly 20% compared with that in 2020.

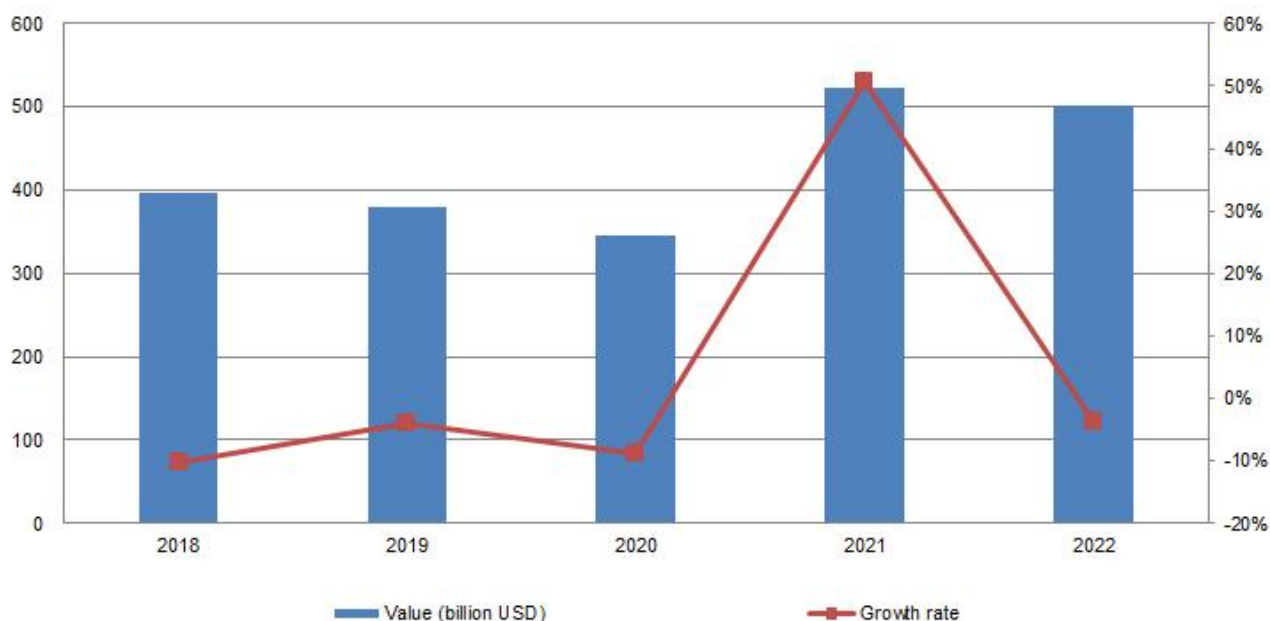
Figure 3.2.1-1 Consumption share of sodium borohydride in pharmaceutical industry by product category in China, 2022



Source:CCM

Value Revenue of the pharmaceutical industry in China decreased from USD396 billion in 2018 to USD502 billion in 2022 USD346 billion in 2020, with a CAGR of 6.13%.

Figure 3.2.1-2 Value and growth rate of pharmaceutical industry in China, 2018–2022



Source: China Food and Drug Administration & CCM

3.2.2 Agrochemicals

Agrochemical industry is the second largest application field of sodium borohydride in China. In 2018–2022, the agrochemicals' consumption of sodium borohydride had been rising from fluctuated between 310 tonnes and 370 tonnes.

Sodium borohydride can be used to produce paclobutrazol (plant growth regulator), emamectin benzoate and pyrethroid (insecticides), tebuconazole and diniconazole (fungicides), and so on. emamectin benzoate, pyrethroid insecticides, paclobutrazol, tebuconazole, and diniconazole and so on. In China, emamectin benzoate is the main agrochemical that consumes sodium borohydride. As a kind of insecticide with high efficiency, low toxicity and low residue, emamectin benzoate has been widely used to protect vegetables, fruit trees, cotton and other crops. Currently, there are two synthetic methods for producing emamectin benzoate, one of which is with sodium borohydride serving as a reducing agent.

In 2018–2022, the consumption of sodium borohydride in the emamectin benzoate industry had been rising:

- In 2020, insecticides such as emamectin benzoate, chlorantraniliprole, and pyrethroids were recommended by the Ministry of Agriculture and Rural Affairs of the People's Republic of China for the prevention and control of *Spodoptera frugiperda* (fall armyworm). The demand for emamectin benzoate had increased, driving up the output.
- In 2021–2022, China's pesticide market experienced a considerable change. The production capacity of emamectin benzoate in China rose from 3,260 t/a in 2021 to 4,150 t/a in 2022, against the sluggish downstream market demand, and the consumption volume of sodium borohydride in emamectin benzoate in China was up from around **193 tonnes in 2018 to 260 tonnes in 2022**. And the price of emamectin benzoate surged in 2021 and declined sustainedly in 2022.

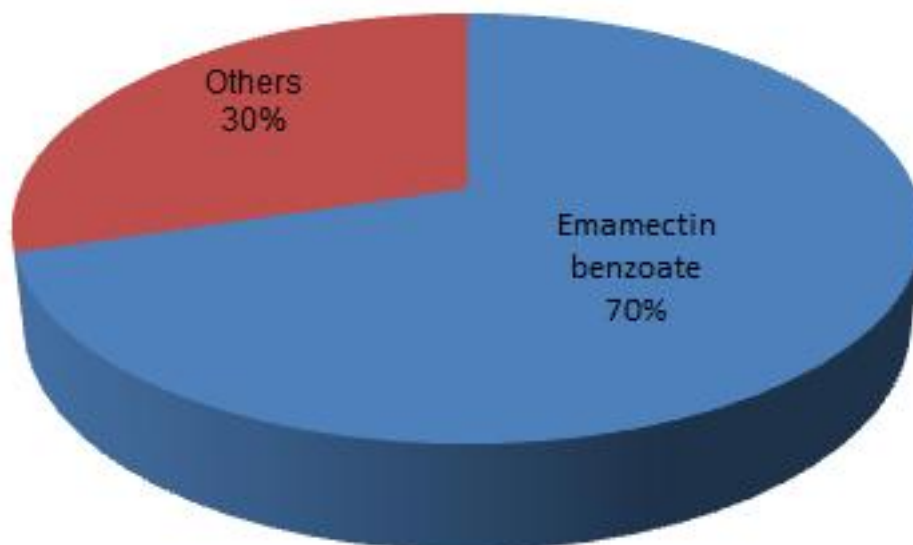
On the other hand, the consumption of sodium borohydride in other agrochemicals (excluding emamectin benzoate) was down to about 110 tonnes in 2022.

In 2018–2022, the consumption of sodium borohydride in the emamectin benzoate industry fluctuated along with the output of emamectin benzoate. Specifically, i In 2020, insecticides such as emamectin benzoate, chlorantraniliprole, and pyrethroids were recommended by the Ministry of Agriculture and Rural Affairs of the People's Republic of China for the prevention and control of *Spodoptera frugiperda* (fall armyworm).. The demand for emamectin benzoate had has increased, driving up the output of emamectin benzoate. In 2020–2022, China's pesticide market experienced a considerable change. The price of emamectin benzoate surged in 2021 and declined sustainedly in 2022. The production capacity of emamectin benzoate in China rose to 4,150 t/a in 2022 from 3,260 t/a in 2021 with a sluggish downstream market demand. Currently, there are two synthetic methods for producing emamectin benzoate. with sodium borohydride serving as a reducing agent.

The consumption of sodium borohydride in other agrochemicals showed an downward trend in 2018–2022.

In 2022, the consumption volume of sodium borohydride in emamectin benzoate in China was around 260 tonnes, while the volume in other agrochemicals was about 110 tonnes.

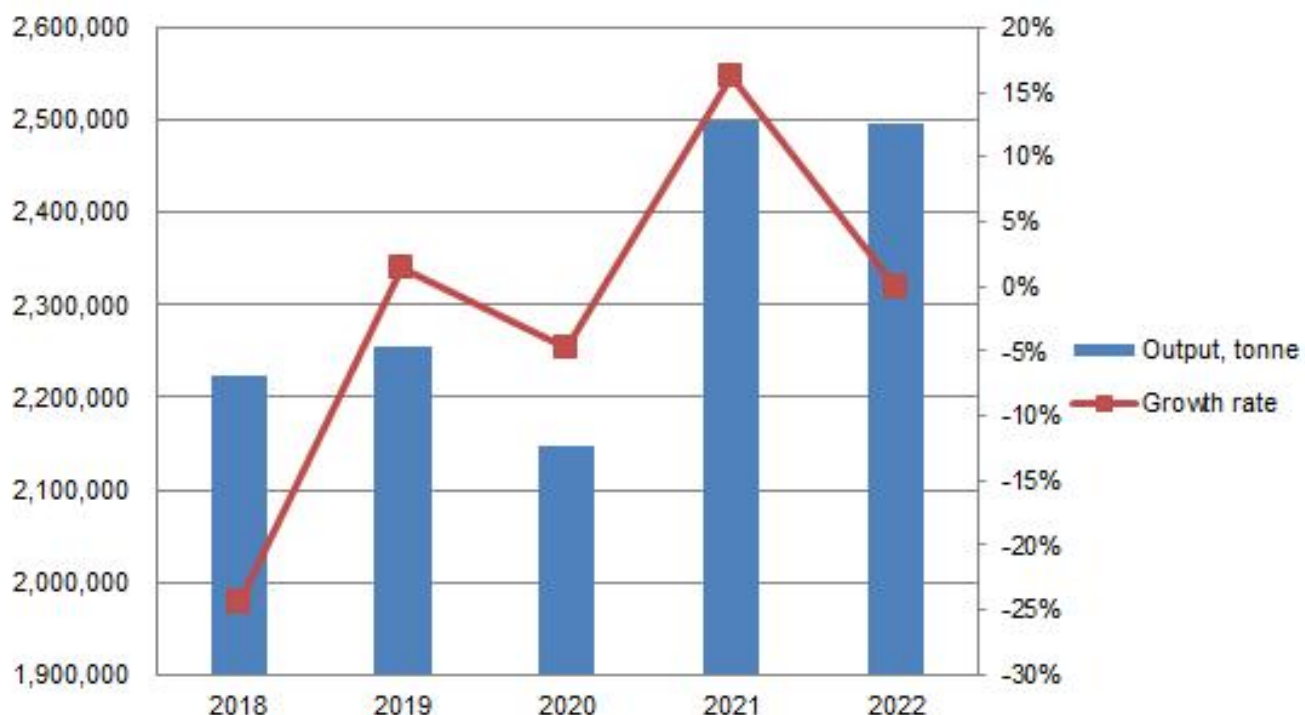
Figure 3.2.2-1 Consumption share of sodium borohydride in agrochemical industry by product in China, 2022



Source:CCM

The output of pesticide technical (converted to 100% AI) increased from 2,223,000 tonnes in 2018 to 2,497,000 tonnes in 2022, at a CAGR of 2.95%. However, in recent years, the growth of pesticide production in China has slowed down compared to the past, which is mainly due to the implementation of stricter environmental protection measures and work safety inspection policies in China.

Figure 3.2.2-2 Output of pesticide technical in China, 2018–2022



Source:CCM

3.2.3 Others

In China, sodium borohydride can be used to make intermediates of dyes and some multi-purpose fine chemicals such as alkamine. Sodium borohydride can also be used in paper making, water treatment, perfume, rubber foaming agents, chemical nickel plating, metal recycling and so on. The total consumption

volume of sodium borohydride in the aforementioned industries is estimated to be about 240 tonnes in 2022. In China, sodium borohydride can be used in the manufacturing of intermediates of dyes, multi-purpose fine chemicals such as alkamine, perfume and rubber foaming agents, as well as in paper making, water treatment, chemical nickel plating, metal recycling, etc. The total consumption volume of sodium borohydride in other areas than pharmaceuticals and agrochemicals was estimated to about 240 tonnes in 2022.

4 Company profiles of key producers

4.1 Shandong Guobang Pharmaceutical Co., Ltd.

Address: No. 02131, West Xiangjiang No. 1 Street, Advanced Manufacturing Industrial Park, Binhai District, Weifang City, Shandong Province 262737, P. R. China

Tel.: +86-536-7575826

Fax: +86-536-7575827

Website: <http://www.sdgbpharm.com>

Established in Dec. 2006, Shandong Guobang Pharmaceutical Co., Ltd. (Shandong Guobang) is a wholly-owned subsidiary of Guobang Pharma Ltd (code 605507), and it is mainly engaged in animal health products and key pharmaceutical intermediates. The company covers an area of about 666,667 m², with a registered capital of RMB104.73 million. Shandong Guobang has more than 1,700 staff and obtained certifications of ISO9001 and ISO14001.

Table 4.1-1 Main products of Shandong Guobang, as of May 2023

Product	Capacity, t/a
Trimethyl borate	20,000
Potassium borohydride	5,000
Sodium borohydride	4,000
N-methylpiperazine	2,000
N,N'-Dimethylpiperazine N,N-	1,000
Florfenicol	2,000
Cyclopropylamine	2,000
Ethylpiperazine	1,000
Cypromazine	500
Liquid sodium borohydride (12%)*	100,000

Note:* Mostly liquid sodium borohydride is consumed to produce solid sodium borohydride, and the rest is sold.

Source: Shandong Guobang Pharmaceutical Co., Ltd.

Shandong Guobang proposed a 6,000 t/a sodium borohydride, 8,500 t/a Methyl 4-chlorobutyrate and 89,500 t/a related intermediates project in H1 2022, which is divided into two phases with the five-year construction period. Currently, the project (phase I) is under construction, including production lines for 6,000 t/a solid sodium borohydride, 40,000 t/a liquid sodium borohydride, 40,000 t/a Trimethyl borate and by-product 44,700 sodium hydroxide SL.

Table 4.1-2 Capacity and output of sodium borohydride in Shandong Guobang, 2018–2022

Year	2018	2019	2020	2021	2022
Capacity, t/a	4,000	4,000	4,000	4,000	4,000
Output, tonne	2,700	2,600	3,100	3,800	3,700

Source: CCM

4.2 Ningxia Best Pharmaceutical Chemical Co., Ltd.

Address: Huanbei No. 6 Road, Ningdong Energy & Chemical Industry Base, Yinchuan City, Ningxia Hui Autonomous Region 750411, P. R. China

Tel.: +86-951-3905678

Fax: +86-951-3905680

E-mail: best@ningbst.com

Website: www.nxbest.com.cn

Ningxia Best Pharmaceutical Chemical Co., Ltd. (Ningxia Best) was established in March 2014, with a registered capital of RMB100 million. Ningxia Best is mainly engaged in the production of pharmaceutical intermediates and it has established school-enterprise R&D cooperation with Ningxia University.

Table 4.2-1 Main products of Ningxia Best, as of May 2023

Product	Capacity, t/a
Sodium methoxide	24,000
Trimethyl borate	14,000
Sodium tert-butoxide	5,000
Sodium ethoxide	3,000
Potassium borohydride	2,500
Sodium borohydride	2,500
Sodium hydride	1,000

Source: Ningxia Best Pharmaceutical Chemical Co., Ltd.

Table 4.2-2 Main products of Ningxia Best, as of May 2023

Product	Capacity, t/a 重新排序
Sodium methoxide	24,000
Sodium ethoxide	3,000
Sodium tert-butoxide	5,000
Potassium borohydride	2,500
Trimethyl borate	14,000
Sodium hydride	1,000
Sodium borohydride	2,500

Source: Ningxia Best Pharmaceutical Chemical Co., Ltd.

Ningxia Best has been constructing an expansion project to add capacities of (designed newly-added capacity of 2,000 t/a sodium borohydride and 2,000 t/a potassium borohydride in phase III, and it is expected to be put into production in H2 2023.

Table 4.2-3 Capacity and output of sodium borohydride in Ningxia Best, 2018–2022

Year	2018	2019	2020	2021	2022
Capacity, t/a	1,000	1,000	1,000	1,000	2,5001,000
Output, tonne	400	350	600	800	800

Source: CCM

4.3 Jiangsu Hongzi New Energy Science & Technology Co., Ltd.

Address: No. 1, Pujiang Road, Fine Chemical Park, Changjiang Town, Rugao City, Jiangsu Province 226532, P. R. China

Tel.: +86-513-87833666, 87581288

Fax: +86-513-87833968

E-mail: hongzihuagong@126.com

Website: www.hongzienergy.com

Jiangsu Hongzi New Energy Science & Technology Co., Ltd. (Jiangsu Hongzi) was established in 2006, with a registered capital of RMB40 million. It is a private-owned company, specializing in the production of

pharmaceutical & pesticide intermediates and the raw materials for electronic products. Jiangsu Hongzi was certified with ISO9001 in 2015.

Table 4.3-1 Main products of Jiangsu Hongzi, as of May 2023

Product	Capacity, t/a
Trimethyl borate	4,000
Potassium borohydride	1,000
Sodium borohydride	500

Source: Jiangsu Hongzi New Energy Science & Technology Co., Ltd.

Table 4.3-2 Capacity and output of sodium borohydride in Jiangsu Hongzi, 2018–2022

Year	2018	2019	2020	2021	2022
Capacity, t/a	500	500	500	500	500
Output, tonne	100	300	350	400	350

Source: CCM

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