

INDUSTRY OVERVIEW

The information and statistics set out in this section and other sections of this document were extracted from the report prepared by Frost & Sullivan, which was commissioned by us, and from various official government publications and other publicly available publications. We engaged Frost & Sullivan to prepare the F&S Report, an independent industry report, in connection with the [REDACTED]. The information from official government sources has not been independently verified by us, the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], any of our or their respective directors and advisers or any other persons or parties involved in the [REDACTED], and no representation is given as to its accuracy.

SOURCE AND RELIABILITY OF INFORMATION

Our Group have commissioned Frost & Sullivan, an independent global market research and consulting firm, to conduct an analysis of, and to prepare a report on, the China graphite industry. The information from Frost & Sullivan disclosed in this document is extracted from the F&S Report. A total fee of RMB970,000 was paid to Frost & Sullivan for the preparation of the report, which we believe reflects market rates for reports of this type. Frost & Sullivan is an independent global consulting firm founded in 1961 in New York and has over 40 global offices with more than 2,000 industry consultants, market research analysts, technology analysts and economists.

The F&S Report was undertaken through both primary and secondary research obtained from various sources. Primary research involved discussing the status of the industry with certain leading industry participants and conducting interviews with relevant parties to obtain objective and factual data and prospective predictions. Secondary research involved reviewing official government publications, company reports, independent research reports and data based on Frost & Sullivan’s own research database.

In compiling and preparing the F&S Report, Frost & Sullivan has adopted the following assumptions (i) the social, economic and political environment in China is likely to remain stable in the forecast period; and (ii) industry key drivers are likely to drive graphite industry in China in the forecast period.

Our Directors have confirmed that after taking reasonable care, Frost & Sullivan is an independent professional market research agency, and the source of information used in this section, which are extracted from the F&S Report, are reliable and not misleading. There is no adverse change in the market information since the date of the F&S Report which may qualify, contradict or have impact on the information of this section.

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China graphite industry overview

Introduction and classification

Graphite is a mineral composed of stacked sheets of carbon atoms with a hexagonal crystal structure. It is gray to black, opaque, and has a metallic luster. Natural graphite is mined from deposits in metamorphic rocks, such as marble, schist, and gneiss, and from accumulations in vein deposits. Natural graphite typically forms as a result of metamorphism of accumulations of organic matter in sedimentary rocks. Synthetic graphite is manufactured by high-temperature heat treatment (graphitization) of, or chemical deposition from, hydrocarbon materials. Synthetic graphite is more than 99.9% graphite, but it has slightly higher porosity, lower density, lower electrical conductivity, and a much higher price than natural graphite. Graphite is considered as a critical and strategic mineral because of its essential applications in the aerospace and energy sectors, especially in the emerging non-carbon energy sector.

Characteristics: Graphite has physical and chemical characteristics of high temperature resistance, high thermal and electrical conductivity, chemical inertness, thermal shock resistance, high radiation emissivity, flame retardance, high compressive strength, flexibility, high resistance to erosion, good machinability, low friction and self-lubrication and many other special properties.

Applications: Natural graphite is suitable for coatings, pencils, powder metallurgy, steelmaking, refractories, lubricants and batteries. For some of these uses, no suitable substitutes are available. Steelmaking and refractory applications in metallurgy use the largest amount of produced graphite; however, emerging technology uses in large-scale fuel cell, battery, and lightweight high-strength composite applications could substantially increase the world demand for graphite.

Classification: For commercial purposes, natural graphite is classified into the following three categories based on its crystallinity, grain size, and morphology: (i) flake graphite concentrate; (ii) crystalline vein (or lump) graphite; (iii) amorphous (microcrystalline) graphite. Flake graphite concentrate and crystalline vein graphite belong to scaly graphite. Well-crystallized graphite flakes have a black metallic luster, whereas microcrystalline material is black and earthy with an amorphous appearance. Flake graphite concentrate can also be further processed into spherical graphite.

- **Flake graphite concentrate:** Flake graphite concentrate is the commercial designation for well-developed crystal platelets of graphite that are between 40 micrometers and 4 centimeters in size. Flake graphite concentrate can be found as a lamella or scaly form in specific metamorphic rocks such as limestone, gneisses, and schists. Froth flotation is used to extract flake graphite concentrate. Most flake graphite concentrates are made by chemical beneficiation processes. Flake graphite concentrates are produced in numerous places worldwide. Major producers include China, Brazil, India, Madagascar, Germany, Austria, Norway, Canada, Zimbabwe, etc. Flake graphite concentrate’s main use include refractories, brake linings, lubricants, batteries, and expandable graphite applications.

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- **Spherical graphite:** Spherical graphite is manufactured from the flake graphite concentrates produced by graphite mines and is the anode material used in lithium-ion batteries (LiB). Typically, flake graphite concentrate is shaped into a rounded, spherical shape by a mechanical attrition process. The rounded shape of spherical graphite, allows for more efficient packaging of particles in a LiB anode, which increases the energy and recharge capacity of the LiB. LiB’s require different spherical graphite sizes as the particle size impacts the performance targets of the LiB. For example, a small spherical graphite particle, would be used in a LiB that has faster charging requirements, while a LiB battery that had large power requirements would use a larger spherical graphite particle. The global production of spherical graphite is currently dominated by China. China uses the mechanical shaping and hydrofluoric acid purification techniques to produce purified spherical graphite. Clean technology of spherical graphite is the continuous application of the integrated preventive environmental strategy to operate and manufacture in order to reduce risk to human beings and the workplace environment. With the transition of the world to a clean, green energy platform, many LiB’s manufacturers are actively seeking alternative supply options. Leading graphite providers are committed to adopt the sustainable and safe production procedure of spherical graphite for green energy and clean technologies.

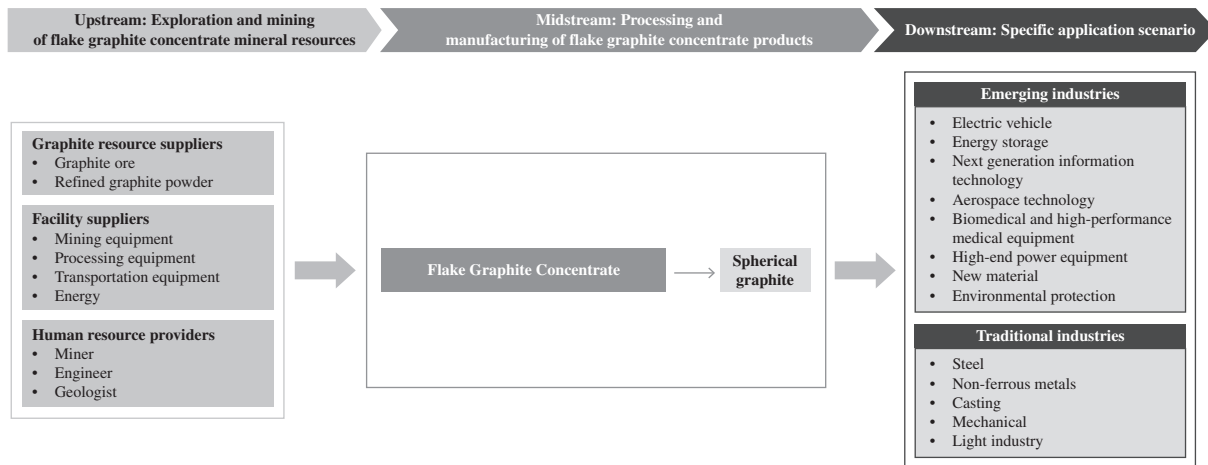
China has developed six major graphite production and processing bases, which account for more than 80% of the country’s output. Among them, crystalline graphite (including flake graphite) is mainly deposited and produced in Heilongjiang (Jixi, Luobei), Shandong (Pingdu) and Inner Mongolia (Xinghe); amorphous graphite is mainly deposited and produced in Hunan (Chenzhou) and Jilin (Panshi).

Value chain of the flake graphite concentrate industry

The industry players in the value chain of the flake graphite concentrate industry mainly consist of mine owners, flake graphite concentrate distributors, flake graphite concentrate product manufacturers and end consumers. The upstream of the flake graphite concentrate industry mainly consists of graphite resource suppliers including graphite ore and refined graphite powder suppliers, facility suppliers such as mining equipment, processing equipment, transportation equipment suppliers and energy suppliers, and human resource providers. After ore mining and primary processing, flake graphite concentrate are sold to the midstream graphite product manufacturers, to be further processed into material grade graphite products. Flake graphite concentrate may also be sold to graphite distributors by mine owners and then sold to graphite manufacturers. Certain manufacturers in midstream are capable of processing mining resources. The downstream of the flake graphite concentrate industry are broad application scenarios of various graphite products. Driven by continuous technology upgrading and policy stimulus, the application scope of flake graphite concentrate products has expanded to many emerging fields, such as electric vehicles, consumer electronics, energy storage, information technology, aerospace, etc. The following chart demonstrates the value chain of the flake graphite concentrate industry.

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Value chain of the flake graphite concentrate industry

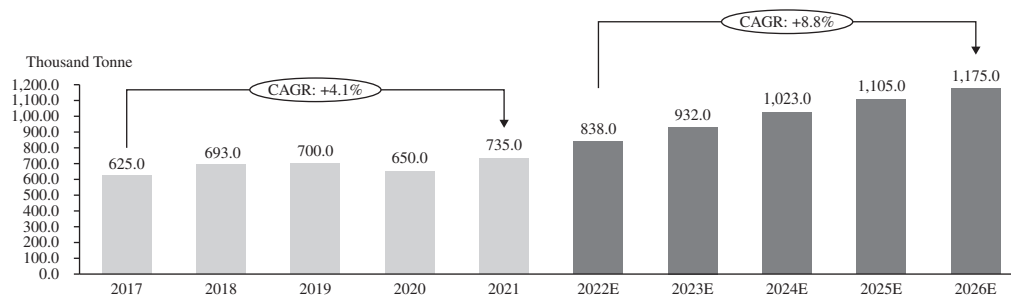


Source: F&S Report

Overview of the China graphite industry

Driven by the growth in lithium-iron batteries and EAF (Electric Arc Furnace) steel sector in China, domestic production of natural graphite increased steadily to approximately 700.0 thousand tonnes in 2019 from approximately 625.0 thousand tonnes in 2017. The decrease of the production of natural graphite in 2020 was mainly due to the outbreak of COVID-19. With the recovery of economy and the resumption of production, the production volume in 2021 increased to approximately 735.0 thousand tonnes. Going forward, with the increasing demand from downstream sectors including refractory materials, lubricant and lithium-ion batteries, the production volume of natural graphite in China is expected to increase continuously at a CAGR of approximately 8.8% from approximately 838.0 thousand tonnes in 2022 to approximately 1,175.0 thousand tonnes in 2026. China is a major producer of natural graphite in the world. In 2021, China produced more than 60% of the world’s graphite. In terms of the production volume of natural graphite, flake graphite accounted for more than 60% in 2021. The following chart sets forth the historical and forecasted production volume of natural graphite in China:

Production volume of natural graphite (China), 2017–2026E

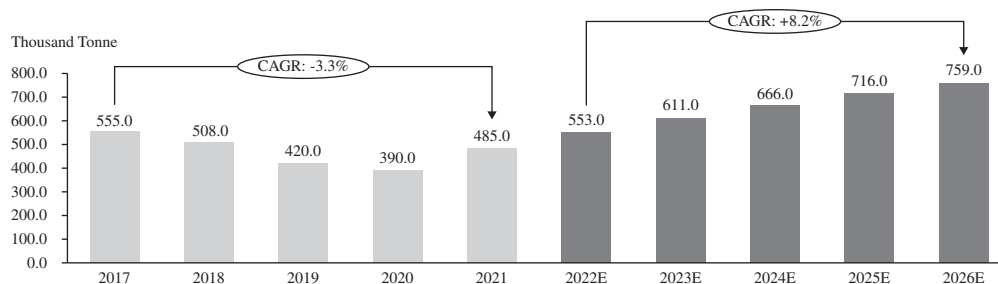


Source: F&S Report, USGS

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The production volume of flake graphite concentrate in China dropped from approximately 555.0 thousand tonnes in 2017 to approximately 390.0 thousand tonnes in 2020. The publication of “National Mineral Resources Planning (2016–2020)” (全國礦產資源規劃(2016–2020年)) reinforced the inspections of companies towards unlicensed exploration, waste of resources and environmental damage. Therefore, the shutting down of enterprises affected by environmental inspections is the main reason behind the shrinkage in domestic flake graphite concentrate production over the past few years. Additionally, many of the deposits being exploited were getting deeper and more expensive to mine which raised the cost of domestic graphite mining. Whereas, leading companies in the flake graphite concentrate industry with rich graphite resources and mature techniques on the production of the graphite are likely to achieve economy of scale and costs reduction. Rapid advances in technological innovation, including automation, digitization, and electrification, are having a fundamental impact on the graphite mining sector. For instance, automated technologies allow companies to avoid staffs working in dangerous conditions, which offer companies further opportunities to reduce and manage their operating costs. The cost of deeper graphite mining could be relatively reduced. Moreover, crystalline graphite (including flake graphite concentrate) has been declared as a strategic mineral due to its potential strategic applications in “National Mineral Resources Planning (2016–2020)”. The Graphite Industry Specific Conditions has also strengthened the strategic position of graphite. Especially flake graphite concentrate has growing importance in high technology applications and green energy sector due to its unique physical and chemical properties. With the rapid development of Chinese economy and increasing downstream demand, especially the expansion of new material industries such as lithium-ion batteries, the use of lithium-ion batteries in vehicles and consumer electronic products will witness a rapid growth. Therefore, the demand for flake graphite concentrate as the main material of lithium-ion batteries will increase. Besides, the demand from steel industry would further drive the production volume of flake graphite concentrate. The production volume of flake graphite concentrate rebounded to approximately 485.0 thousand tonnes in 2021 and is forecasted to experience an increase from approximately 553.0 thousand tonnes to approximately 759.0 thousand tonnes in the next five years, representing a CAGR of approximately 8.2%. The following chart sets forth the historical and forecasted production volume of flake graphite concentrate in China:

Production volume of flake graphite concentrate (China), 2017–2026E



Source: F&S Report

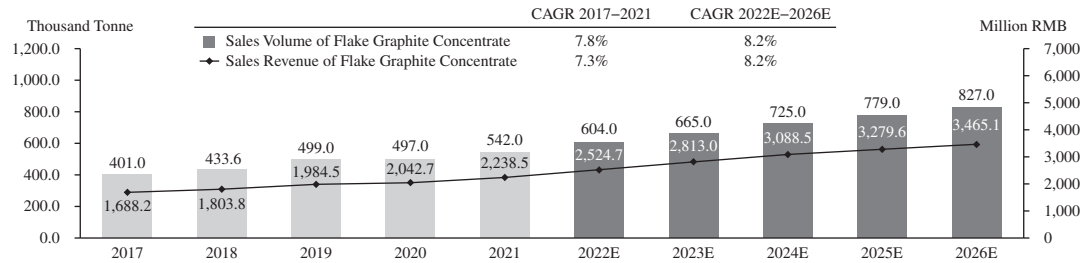
The substitution of graphite by other minerals is currently low due to its unique chemical and physical properties. Flake graphite concentrate is ideally suited for a wide range of industrial and technological applications. The current major application of flake graphite concentrate includes batteries, refractories, foundries, lubricants, etc. The batteries segment is expected to be one of the fastest growing application sectors over the forecast period. The lithium-ion batteries market in China is expected to grow rapidly, owing to the growth in adoption of NEVs and energy storage systems. Therefore, the demand of flake graphite concentrate would further increase. The sales volume and revenue of China flake graphite concentrate have grown steadily since 2017. In 2021, the sales volume and revenue of flake graphite concentrate reached 542.0 thousand tonnes and RMB2,238.5 million, respectively.

The graphite mining technology has constantly been upgraded and improved as emerging technology such as Internet of things, drones and automation has been adopted. As graphite is the core materials of EV batteries, the graphite industry is expected to witness a higher growth rate in the next few years driven by the positive policies such as 14th Five-Year Plan (2021–2025) for National

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Economic and Social Development and Long-Range Objectives for 2035 and increasing demand from downstream markets. Driven by the opportunities including benefits from industry-favored policies, advancement on graphite manufacturing technology and increasing demand of downstream industries, the sales volume of flake graphite concentrate is expected to increase to approximately 827.0 thousand tonnes in 2026, representing a CAGR of approximately 8.2% from 2022. The sales revenue of flake graphite concentrate is expected to further increase to approximately RMB3,465.1 million in 2026, illustrating a CAGR of approximately 8.2% from 2021. The following chart sets forth the historical and forecasted sales volume and sales revenue of flake graphite concentrate in China:

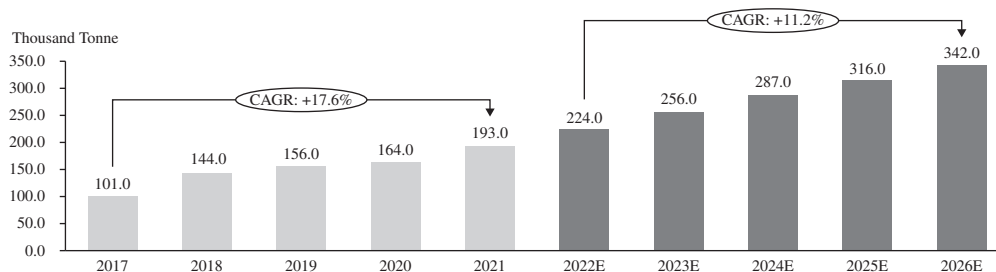
Sales volume and sales revenue of flake graphite concentrate (China), 2017–2026E



Source: F&S Report

Spherical graphite is manufactured from flake graphite concentrate and can be used in the production of lithium-ion batteries (being one of the key raw materials). Influenced by the continuous policy incentives in electronic vehicle manufacturing and electronic information industry, according to China Association of Automobile Manufacturer, the sales volume of electronic vehicle increased from approximately 0.5 million units in 2016 to approximately 3.3 million units in 2021, with a CAGR of approximately 45.7%. The electronic vehicle market in the PRC is expected to grow in next few years driven the proposal of carbon neutral and green energy. The sales volume is expected to reach 9.6 million in 2026. The booming development of electronic vehicle industry promoted the growing demand of lithium-ion batteries in previous years, which paves the way for the market growth of spherical graphite. The domestic production volume of spherical graphite witnessed a steady increase at a CAGR of approximately 17.6% from approximately 101.0 thousand tonnes in 2017 to 193.0 thousand tonnes in 2021. Affected by the outbreak of COVID-19, the growth rate of spheric graphite production volume slowed down a little bit in 2020. Looking forward, the growing downstream markets are projected to offer opportunities for the spherical graphite providers over the next five years. Along with potential technology improvement, domestic production will increase steadily from approximately 224.0 thousand tonnes in 2022 to approximately 342.0 thousand tonnes in 2026, illustrating a CAGR of approximately 11.2%. The following chart sets forth the historical and forecasted production volume of spherical graphite in China:

Production volume of spherical graphite (China), 2017–2026E

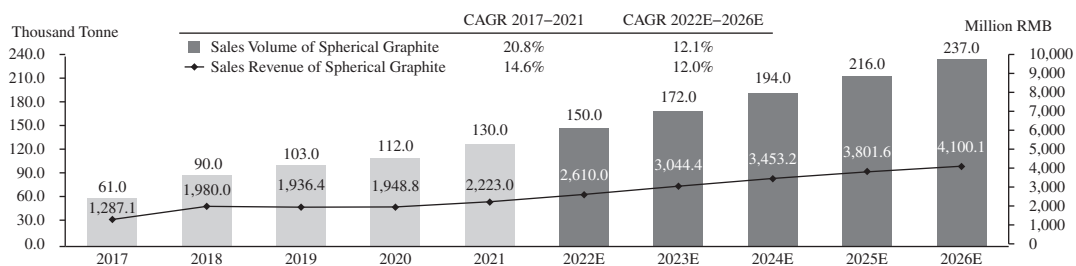


Source: F&S Report

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The sales volume of spherical graphite in China went through a significant increase in previous five years, growing from approximately 61.0 thousand tonnes in 2017 to approximately 130.0 thousand tonnes in 2021, illustrating a fast CAGR of approximately 20.8%. Likewise, the sales revenue also benefited from the huge market demand, which increased from approximately RMB1,287.1 million in 2017 to approximately RMB2,223.0 million in 2021 at a CAGR of approximately 14.6% during the same period. China possesses the vast majority of processing and consumption of battery-grade spherical graphite in the world. The fining and processing technology of spherical graphite are expected to improve continuously in the near future in response to huge demand from downstream market. The incentives of NEVs, especially the “Notice on Further Improving the Policy for the Promotion and Application of Financial Subsidy for New Energy Vehicles” (關於進一步完善新能源汽車推廣應用財政補貼政策的通知) issued by the Ministry of Finance, Ministry of Industry and Information Technology, Ministry of Science and Technology and National Development and Reform Commission in December 2020, will further promote the production of NEVs as well as the demand for lithium-ion batteries. On January 21, 2022, seven departments including the National Development and Reform Commission issued the “Implementation Plan for Promoting Green Consumption” (促進綠色消費實施方案), proposing to vigorously develop green transportation consumption. Moving forward, the sales volume of spherical graphite in China is estimated to surge from approximately 150.0 thousand tonnes in 2022 to approximately 237.0 thousand tonnes in 2026, representing a CAGR of approximately 12.1%. The sales revenue is expected to grow from approximately RMB2,610.0 million in 2022 to approximately RMB4,100.1 million in 2026 at a CAGR of approximately 12.0%. The following chart sets forth the historical and forecasted sales volume and sales revenue of spherical graphite in China:

Sales volume and sales revenue of spherical graphite (China), 2017–2026E



Source: F&S Report

Overview of graphite industry in Heilongjiang province

Heilongjiang Province is a large province of graphite mineral resources and rich in graphite resources. The reserve of graphite in Heilongjiang Province is mainly deposited and produced in Jixi City and Luobei County. As at April 2021, there were 14 graphite extraction and processing companies with mining rights in Heilongjiang Province. According to the “Heilongjiang Provincial Government Work Report” 《黑龍江省政府工作報告》, it is proposed to continue to promote the construction of industrial projects and promote the construction of graphite production and processing bases in Jixi City and Hegang City, as well as to improve the technological innovation ability and level of graphite industry. The favorable government policies and rich graphite resources in Heilongjiang Province would further drive the expansion and booming development of the graphite industry in Heilongjiang Province. In 2020, the production volume of flake graphite concentrate in Heilongjiang accounted for over 60% of the total production volume of flake graphite concentrate in China. Due to the advantages of graphite reserve in Heilongjiang Province, the graphite industry represented a promising prospect with over 50% of flake graphite concentrate market participants concentrated in Heilongjiang Province.

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Entry barriers

According to the F&S Report, the entry barriers of China graphite industry include the followings:

- (i) **Technology barrier:** Due to the limited upstream graphite resources and supply, the graphite market is very competitive. When selecting graphite materials or products, downstream application companies will take technology as a key factor into account. At the same time, driven by the upgrading of terminal electronic products as well as the further penetration of electric vehicles, the downstream manufacturers will have higher requirements on the technology and performance indicators of graphite materials and products. For example, anode materials will develop towards high specific capacity, high charge-discharge efficiency, high cycle performance and lower cost. As a result, anode material suppliers have been promoted to increase research and development investment, speeding up technological innovation and continuously developing high-performance products, which usually requires strong technology and talent accumulation as well as time and capital investment. Therefore, technology become one of the major barriers of graphite industry.
- (ii) **Customer barrier:** The customers of graphite providers are mainly industrial manufacturers. These customers tend to have strict requirement and screening process to do business with new supplier. The relationship between graphite providers and customers are mostly long-term and recurring, which allows experienced graphite providers to establish a solid customer-base and set up a high barrier to new entrants. New entrants would have to compete against experienced players who have mature setup and networks, and would not able to build close relationship and networks in a short time.
- (iii) **Channel barrier:** Driven by technology and policies, the application of graphite has penetrated a variety of fields, and the demand for graphite products is rising rapidly among enterprise-level users in different regions and industries, especially in the fields of electric vehicles and consumer electronics. Whether the sales channels of graphite manufacturing companies are complete and whether the coverage of the marketing network is extensive determines the company's market competitiveness. Leading companies have gradually established a stable and extensive distribution system and marketing network in the long-term business process. At the same time, major graphite providers continue to deepen their communication and integration with upstream and downstream market participants as the scarcity of upstream raw materials becomes more and more evident. Graphite manufacturers consolidate their leading positions in the industry through partnerships with or direct acquisitions of upstream graphite miners and raw material suppliers or with a variety of downstream companies. It is difficult for new entrants to establish a competitive channel system in the short term.
- (iv) **Capital barrier:** The graphite industry is a capital-intensive industry, which requires a lot of investment in infrastructure and production equipment in the early stage. This is mainly because the graphite manufacturing needs a large amount of initial capital for the procurement of upstream primary graphite, the construction of manufacturing factories as well as the purchase or installation of machineries in order to produce various graphite materials and products. With the rapid changes of the market, the need to expand production and upgrade manufacturing techniques in time poses a challenge to the capital of the

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enterprise. If the new entrants do not have enough capital reserves to cope with the changes and follow up the trends of the market, it is difficult for them to keep a leading position in the competition.

Market drivers and trends

According to the F&S Report, the main drivers and trends of China graphite industry includes the followings:

(i) *Wider application and rising downstream demand:*

Steelmaking and refractory applications in metallurgy use the largest amount of produced graphite; however, emerging technology uses in battery, large-scale fuel cell, and lightweight high-strength composite applications could substantially increase the world demand for graphite.

- ***High demand from refractories manufacturing:*** The development of refractory manufacturing has led to an increase in demand for graphite. One of the main usages of natural graphite is to produce refractory materials (such as magnesia-carbon refractory bricks, crucibles, ladles and molds containing molten metal), making the demand for graphite closely linked with metallurgy and steelmaking, chemical engineering, petroleum, machinery manufacturing, silicate, power and other industrial fields. According to World Steel Association, in 2021, the production of crude steel in China reached 1,032.8 million tonnes and expect to increase to around 1,200.0 million tonnes in 2025. Although the graphite industry has made considerable progress in other new application fields in recent years, the refractory manufacturing industry remains as the largest consumption field of graphite. As the metallurgical and steelmaking industries will still maintain a fundamental position in economic development, the demand for graphite will remain robust in the future.
- ***Increasing demand for lithium-ion batteries:*** The structure of graphite consumption growth is gradually shifting from traditional industries to strategic emerging industries such as new energy vehicles, energy storage, nuclear energy, and electronics is increasing rapidly. The conductivity of graphite is significantly better than other non-metals, making it the most widely used anode material for lithium-ion batteries at present. Lithium-ion batteries are smaller, lighter and more powerful than traditional batteries and have a flat voltage profile meaning they provide almost full power until discharged, whose production volume in China increased rapidly from approximately 7.84 billion in 2016 to approximately 17.56 billion in 2020, illustrating a CAGR of approximately 22.3%. As the world transforms to a clean energy base across the NEVs and energy storage, the global demand for cost effective energy storage solutions continues to drive the growth of the lithium-ion batteries market and graphite market as well. Specifically, the electric vehicle industry in China has achieved rapid development in the past few years, with the sales volume of NEVs representing a CAGR of approximately 45.7% from approximately 507 thousand units in 2016 to approximately 3,334 thousand units in 2021. Driven by policy stimulus and technology progress, the market space for the application of graphite in the field of electric vehicle will be further released. Moreover, lithium-ion batteries have become one of the world's major energy storage systems due to the high energy density, high power density and high

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efficiency. It has been widely used in various energy storage fields such as grid energy storage, household energy storage, and communication energy storage. With the continuous development of clean energy, distributed power grids, micro grids, NEVs charging piles and other industries, the market demand for lithium-ion batteries will further increase, promoting the application of graphite as well. Hence, under the energy conservation and environmental protection trend globally, the driving force for the demand in the lithium-ion battery market in the future will mainly come from transportation and industrial energy storage, thus boosting the fast and continuous growth of graphite industry.

- ***Emerging demand for expandable graphite:*** Expandable graphite is one of the fastest growing markets along with lithium-ion batteries though its market size is quite small at present. It is produced by treating flake graphite with a dilute acid solution and heating it to cause the flakes to split apart, expand and increase hundreds of times in volume. This material is pressed into sheets which can be used in many applications including thermal management in consumer electronics, advanced building materials, heat and corrosion resistant gaskets, flow batteries and fuel cells which have the potential to consume as much graphite as all other uses combined in the future. In addition, expandable graphite is the only segment of graphite market to experience rising prices in recent years. The emerging commercial applications and unexpectable potential of expandable graphite is a new significant force to promote the development of graphite industry.

(ii) *Upgrading and innovations of mining and producing techniques*

- ***Development of deep processing technologies for high-end products:*** With the constantly breakthroughs of deep processing technologies including chemical & thermal purification technology, coating technology, carbonization technology, etc., the mass-production and wide application of high-end graphite products including spherical graphite, expandable graphite, high-purity graphite, flexible graphite and graphene is achievable in nearly future. For example, the chemical purification technology is applied to further purify the graphite concentrate to TGC (total graphitic carbon) 99.99%, used for producing high-tech products such as fuel cells which require higher purity than typically upgraded by flotation. In order to get ultra-high purity graphite, the fine intergrown minerals residing between the graphite layers have to be removed, which can be achieved by one or multi-stage acid washing with different acids or combinations. An alternative to acid treatment is thermal purification by heating the graphite above 2,000°C. High-end graphite products has become indispensable key materials in the fields of aerospace, nuclear, new energy cars, energy storage, nuclear, environmental protection, new materials and other strategic emerging industries. The industrialization and successful applications of graphene is once again pushing up the strategic position of the graphite. The modern high-end deep processing of graphite will be of significance in promoting the upgrading of China graphite industry, as well as one of the most important means of China graphite manufacturers into the global market.
- ***Improvement of graphite mining technology:*** During the graphite mining process, the use of automation, IoT and underground-drones for 3D mapping are gaining popularity, which brings higher levels of safety, improvements in performance and productivity,

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and reducing costs of mining. The application of equipment with high degree of autonomy and efficiency for the roughening and flotation of graphite facilitates the beneficiation of high carbon content flake graphite concentrate without severe damage to graphite crystals. Moreover, IoT allows machineries to become smarter and more productive through the use of sensors, and also facilitates time savings, safer mining, predictive maintenance, and other benefits related to automation, energy and costs. In addition, 3D maps of graphite mines enable engineers and designers to plan the layout and action plan before setting foot on the mine, resulting in short gestation periods. 3D maps of graphite mines are obtained by deploying underground-mapping drones with onboard sensors that scan the surroundings of the mines and build a schematic 3D map. In addition to 3D mapping, sensors on underground-mapping drones can also be used to monitor fluid levels, temperatures and vibrations at mines, resulting in timely maintenance based on the evidence rather than waiting for planned routine operations.

(iii) Favorable policy environment

- ***More scientific and comprehensive regulation system of graphite industry:*** Recently, China has been making efforts on improving and upgrading graphite industry by establishing a regulation basis. The “Graphite Industry Specification Conditions” (《石墨行業規範條件》) issued by the Ministry of Industry and Information Technology in July 2020 put forward higher requirements for graphite industry in terms of processing technology, product quality, and resource protection. With the improvement of the strategic position of graphite resources, the graphite industry chain is facing a trend of integration and upgrading. At present, the domestic graphite industry is still in a state of low-end and disorderly development, and the supply of low-end products exceeds demand. The introduction of new regulations is expected to drive the industry to shift to high value-added products and technological innovation-driven transformation. In addition, the project of “the Key Technology and Demonstration of Reduction of Graphite Resources from the Mining and Processing Source” (《石墨資源開採加工源頭減量關鍵技術與示範》) was successfully approved by Ministry of Science and Technology. The project focuses on conquering bottlenecks of deep processing technologies, puts forward the solutions and technical routes to produce high-end graphite products, and is expected to improve the technology of utilizing and recycling graphite solid waste.
- ***Supportive initiatives for graphite downstream industries:*** Graphite and cutting-edge graphene materials are widely used in many fields such as the new generation of information technology, energy-saving and new energy vehicles, power equipment, new materials, etc., which are the key development fields promoted by “Made in China 2025” (《中國製造2025》). According to the newly issued “Electric Vehicle Industry Development Plan (2021–2035)” (《新能源汽車產業發展規劃(2021–2035年)》) in November 2020, major breakthroughs in key technologies such as power batteries, drive motors and vehicle operating systems are expected to be made by 2025. Driven by policy stimulus and technology progress, the market space for the application of graphite in the field of electric vehicle will be further released. In addition, China also promulgated a series of policies supporting the development of graphene industry, including “Several Opinions on Accelerating the Innovation and Development of the

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Graphene Industry” (《關於加快石墨烯產業創新發展的若干意見》), “Guide to the Development of New Materials Industry” (《新材料產業發展指南》), “Guiding Catalogue for the First Batch Application Demonstration of Key New Materials (2019 Edition)” (《重點新材料首批次應用示範指導目錄(2019年版)》), etc. These policies have established the important strategic position of graphene in the fields of electrochemical energy storage, marine engineering, flexible electronic devices, major environmental protection technology and equipment, automobiles, and aerospace industries.

Average selling price of major products of flake graphite concentrate and spherical graphite

Flake graphite concentrates are normally classified by different carbon content specification. Flake graphite concentrates with different carbon concentrations are applied in different areas. Spherical graphite is usually classified by different size. The average selling prices of flake graphite concentrate and spherical graphite may vary by different specification and generally influenced by factors such as production costs, market demands and macro economy. From 2018, many Chinese spherical graphite companies began to expand the spherical production capacity, which resulted in the decrease in the average selling price of spherical graphite in 2019 and 2020. Going forward, with the recovery of economy and continuously increasing demand from lithium-ion batteries industry, the demand of graphite would increase, which in turn would drive the average selling price of flake graphite concentrate and spherical graphite. The following table sets forth the average selling price of major products of flake graphite concentrate with different carbon content specification and spherical graphite, respectively in China:

Average Selling Price of Major Products of Flake Graphite Concentrate and Spherical Graphite (China), 2019–2021

	2019 ASP <i>(Thousand RMB/tonne)</i>	2020 ASP <i>(Thousand RMB/tonne)</i>	2021 ASP <i>(Thousand RMB/tonne)</i>
Flake graphite concentrate			
194	3.7	3.6	3.8
195	4.1	4.0	4.1
196	4.4	4.4	4.5
Spherical graphite			
SG-10	19.2	18.0	17.8
SG-9	15.4	13.4	14.3

Note: The SG-9 products above refer to the spherical graphite products that have not been purified.

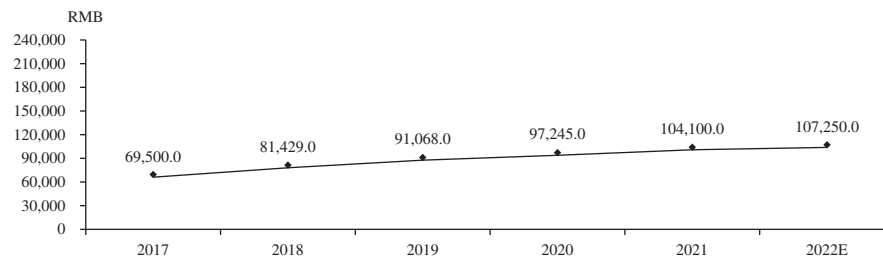
Average annual wage level of workers in the graphite industry, electricity price and unprocessed graphite price

Labor cost is considered as one of the key cost components comparing to other operational costs for graphite industry in China. The average annual wages of workers in graphite industry in China increased from approximately RMB69,500 in 2017 to approximately RMB104,100 in 2021, representing a CAGR of approximately 10.6%. From 2017 to 2021, the CAGR of average annual wage of workers in graphite industry was slightly higher than the average level in China, mainly due to the transformation in the mining and graphite industry. The promulgation of environmental protection policies and frequent inspections from government have accelerated the transformation of many graphite manufacturers and promoted the improvement of the graphite mining technology. The use of automation, IoT and underground-drones for 3D mapping are gaining popularity, which brings higher levels of safety,

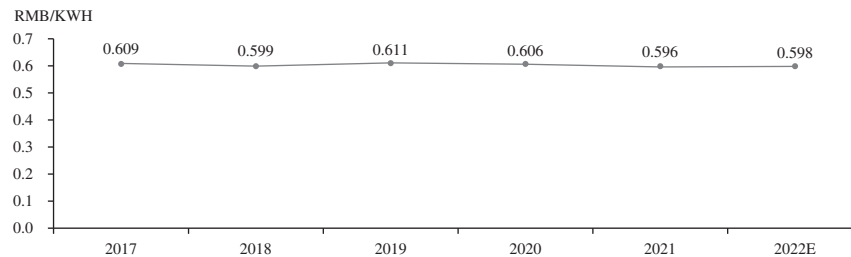
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improvements in performance and productivity, and reducing costs of mining. Also, many graphite manufacturers have introduced sophisticated regulation to manage the environmental protection issue. This trend brought positive development for major graphite manufacturers and thus the average annual wage of workers in graphite industry is expected to continuously increase. The average selling price of electricity in China was approximately RMB0.596 per KWH in 2021. Going forward, the average selling price of electricity is expected to decrease as provincial governments are continuously improving business environments for companies and reducing electricity costs. The average selling price of electricity is expected to drop to approximately RMB0.598 per KWH in 2022. Moreover, the price of unprocessed graphite is expected to drop to approximately RMB0.598 per KWH in 2022. Morevoer, the price of unprocessed graphite maintained stable from 2017 to 2019. In 2019, the average price of unprocessed graphite in China reached approximately RMB53.3 per tonne. Due to the impact of COVID-19, the average price of unprocessed graphite increased to approximately RMB68.0 per tonne in 2020. Going forward, with the recovery of the economy, the average price of unprocessed graphite would maintain at a stable level. The below chart sets forth the historical and forecasted average annual wage of workers in graphite industry, average price of electricity and average price of unprocessed graphite in China:

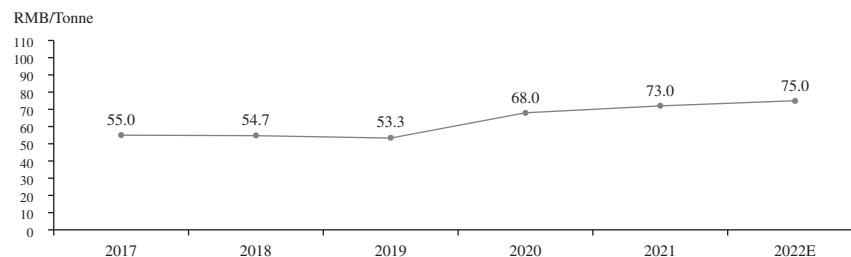
Average annual wage of workers in graphite industry (China), 2017–2022E



Average selling price of electricity (China), 2017–2022E



Average price of unprocessed graphite (China), 2017–2022E



Source: F&S Report

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Competitive landscape

In most cases, producers of the graphite products may directly purchase graphite ores from upstream suppliers or explore the graphite from the mining resources owned by themselves. According to the China Graphite Resources Survey Report published by Chinese Academy of Geological Sciences, graphite resources are widely distributed throughout China, and there are more graphite resources in the east than in the west. At present, graphite mines have been discovered in around 25 provinces (municipalities, autonomous regions), with a total of 91 mining areas. Specifically, in terms of the reserves of crystalline graphite ores, Heilongjiang, Inner Mongolia, Sichuan, Shanxi and Shandong Provinces account for more than 85% of China crystalline graphite reserves.

Graphite has become an important strategic resource in the world as it is widely used in many industries and further promotes the development of national economy. However, graphite in nature contains many impurities, which makes it difficult to be used directly. Therefore, the graphite needs to be purified before used in the downstream markets. Flake graphite concentrates with different carbon concentrations are applied in different areas. For instance, flake graphite concentrate with carbon content mainly between 94% and 98% are used for the production of the heat resistant magnesia carbon brick and other heat resistant materials. Moreover, spherical graphite is mainly manufactured from high carbon content flake graphite concentrate, which can be used for anode materials and batteries in computers, mobile devices and electric vehicles. The production of flake graphite concentrate with high carbon concentrations normally requires advanced purification techniques and equipment, which poses a higher technique barrier to the new entrants.

In 2021, the sales revenue of flake graphite concentrate in China reached RMB2,238.5 million. China flake graphite concentrate industry was concentrated with top ten companies accounting a total market share of 49.8% by sales revenue in 2021. There were over 120 market participants in flake graphite concentrate industry in 2021. The flake graphite concentrate sales revenue of our Group was ranked fifth in 2021 with approximately RMB97.7 million, accounting for a market share of 4.4% of total flake graphite concentrate industry by sales revenue. According to the F&S Report, the leading companies of flake graphite concentrate industry in China by sales revenue include the following:

Top ten companies by sales revenue in flake graphite concentrate industry (China), 2021

Ranking	Company	Sales Revenue of Flake Graphite Concentrate (Million RMB)	Market Share
1	Company A	228.0	10.2%
2	Company B	215.0	9.6%
3	Company C	165.0	7.4%
4	Company D	134.0	6.0%
5	Our Group	97.7	4.4%
6	Company E	72.0	3.2%
7	Company F	67.0	3.0%
8	Company G	51.0	2.3%
9	Company H	45.0	2.0%
10	Company I	39.0	1.7%

Source: F&S Report

Notes:

- Company A refers to Qingdao Haida Graphite Co., Ltd.* (青島海達石墨有限公司), an unlisted Chinese company established in 1988, which primarily engages in the production of flake graphite concentrate, high-carbon graphite, high-purity graphite, and spherical graphite. It has graphite production lines with innovative technological process.

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2. Company B refers to Jixi Northeast Asia Mineral Resources Co., Ltd* (雞西東北亞礦產資源有限公司), an unlisted Chinese company established in 2011, which primarily engages in the production of flake graphite concentrate, high-carbon graphite, and medium-carbon graphite.
3. Company C refers to Jixi Changyuan Mining Co., Ltd* (雞西長源礦業有限公司), an unlisted Chinese company established in 2011, which mainly engages in the production of flake graphite concentrate and artificial graphite. It is indirectly owned by BTR New Material Group Co. Ltd.* (貝特瑞新材料集團股份有限公司). Headquartered in Shenzhen, China, BTR New Material Group Co., Ltd.* (貝特瑞新材料集團股份有限公司) has been listed on the National Equities Exchange and Quotations since 2015.
4. Company D refers to Ulanqab Darsen Graphite New Material Co., Ltd.* (烏蘭察布市大盛石墨新材料股份有限公司), an unlisted Chinese company established in 2012, which mainly engages in the production of flake graphite concentrate and spherical graphite. It established a development model of the industry chain of graphite deep processing.
5. Company E refers to Jixi Puchen Graphite Co., Ltd* (雞西市普晨石墨有限責任公司), an unlisted Chinese company established in 2004, which primarily engages in the production of flake graphite concentrate. It owns mining rights and is one of the graphite production enterprises in Heilongjiang Province, the PRC.
6. Company F refers to Jixi Jinhua Feng Graphite Manufacturing Co., Ltd* (雞西市金華豐石墨製造有限公司), an unlisted Chinese company established in 2006, which primarily engages in the production of flake graphite concentrate and other graphite products.
7. Company G refers to Luobei Aoxing New Material Co., Ltd* (蘿北奧星新材料有限公司), an unlisted Chinese company established in 2011, which primarily engages in the production of flake graphite concentrate and other graphite products. It is a sino-foreign joint venture of graphite deep processing.
8. Company H refers to Jixi Fenglu Graphite Co., Ltd* (雞西市豐祿石墨有限責任公司), an unlisted Chinese company established in 1999, which mainly engages in the production of flake graphite concentrate.
9. Company I refers to Luobei Xinlongyuan Graphite Products Co., Ltd* (蘿北縣鑫隆源石墨製品有限公司), an unlisted Chinese company established in 2008, which mainly engages in the production of flake graphite concentrate.

In 2021, the sales revenue of spherical graphite in China reached RMB2,223.0 million. China spherical graphite industry was concentrated with top ten companies accounting a total market share of 70.0% by sales revenue in 2021. There were over 60 market participants in spherical graphite industry in 2021. Our Group ranked sixth in 2021 with a market share of 4.1% by sales revenue. According to the F&S Report, the leading companies of spherical graphite industry in China by sales revenue include the following:

Top ten companies by sales revenue in spherical graphite industry (China), 2021

Ranking	Company	Sales Revenue of Spherical Graphite (Million RMB)	Market Share
1	Company A	371.0	18.0%
2	Company J	293.0	14.2%
3	Company K	230.0	10.8%
4	Company L	153.0	7.0%
5	Company M	120.0	5.8%
6	Our Group	90.3	4.1%
7	Company N	65.0	3.4%
8	Company O	54.0	2.5%
9	Company D	49.0	2.2%
10	Company P	45.0	2.0%

Source: F&S Report

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Notes:

1. Company J refers to Qingdao Guangxing Electronic Materials Co., Ltd* (青島廣星電子材料有限公司), an unlisted Chinese company established in 2010, which primarily engages in the production of spherical graphite and flake graphite concentrate. Its products are used in mercury-free alkaline batteries, power batteries, lithium-ion batteries, nickel-hydrogen batteries and nanomaterials.
2. Company K refers to Qingdao GR-TAIDA Carbon Co., Ltd* (青島泰達天潤碳材料有限公司), an unlisted Chinese company established in 2003, which primarily engages in the production of spherical graphite and other graphite products. Its products are exported to overseas countries, including, Japan, the United States and Southeast Asia.
3. Company L refers to Zhanjiang Juxin New Energy Co., Ltd* (湛江市聚鑫新能源有限公司), an unlisted Chinese company established in 2006, which mainly engages in the production of spherical graphite.
4. Company M refers to Graphex Group Limited* (烯石電動汽車新材料控股有限公司), a Hong Kong listed company (HKEx Stock Code: 6128) established in 2013, which primarily engaged in the development, production and sale of graphene products. It also focuses on the research and development of renewable energy.
5. Company N refers to Qingdao Qingbei Carbon Co., Ltd* (青島青北碳素製品有限公司), an unlisted Chinese company established in 2014, which mainly engages in the production of spherical graphite.
6. Company O refers to Qingdao Taihelong New Energy Co., Ltd* (青島泰和隆新能源材料有限公司), an unlisted Chinese company established in 2009, which mainly engages in the production of spherical graphite.
7. Company P refers to Qingdao Black Dragon Graphite Co., Ltd.* (青島黑龍石墨有限公司), an unlisted Chinese company established in 1996, which mainly engages in the production of spherical graphite, high-carbon graphite, high purity graphite and micro-powder graphite. It focuses on research and development and established cooperation with research institutions in the PRC and overseas.