

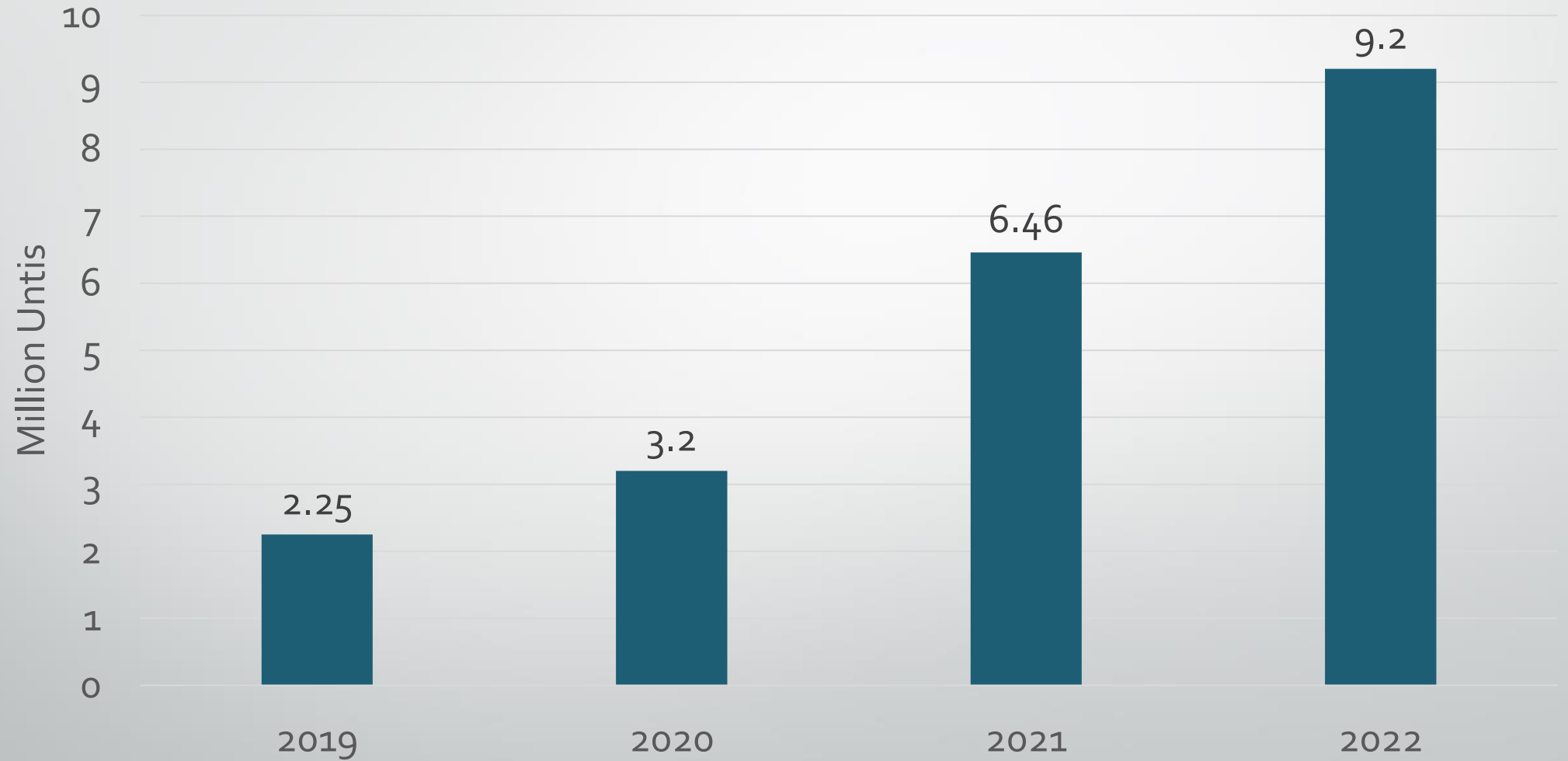


Lithium Battery Anode Material – Development in China

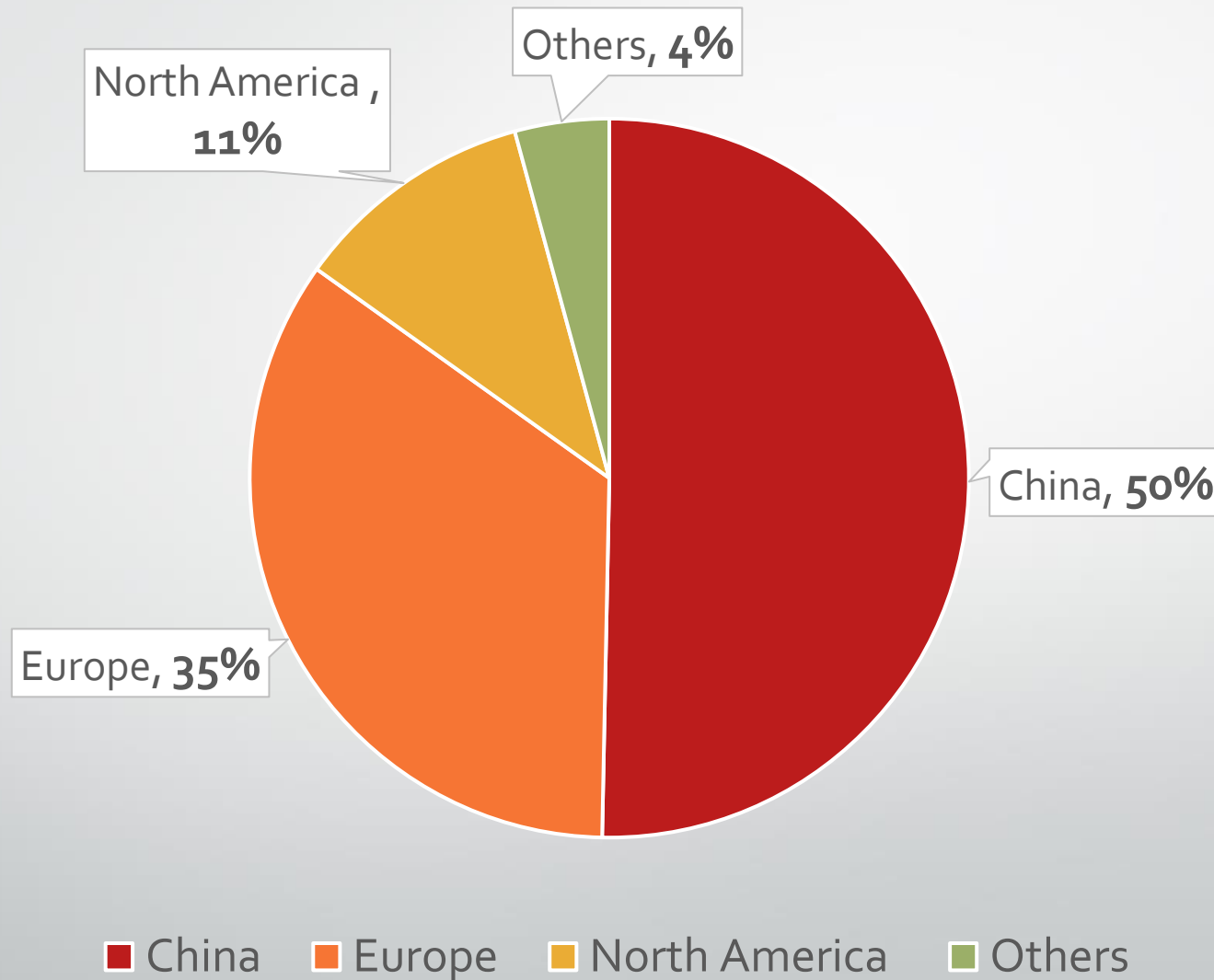
Deng Xiaoxing
East River Asia Limited

ITA Conference Rome, September 2022

1. Global Sales Growth of EV



2. 2021 Global Sales of EV, by Region



3. Global Demand Forecast

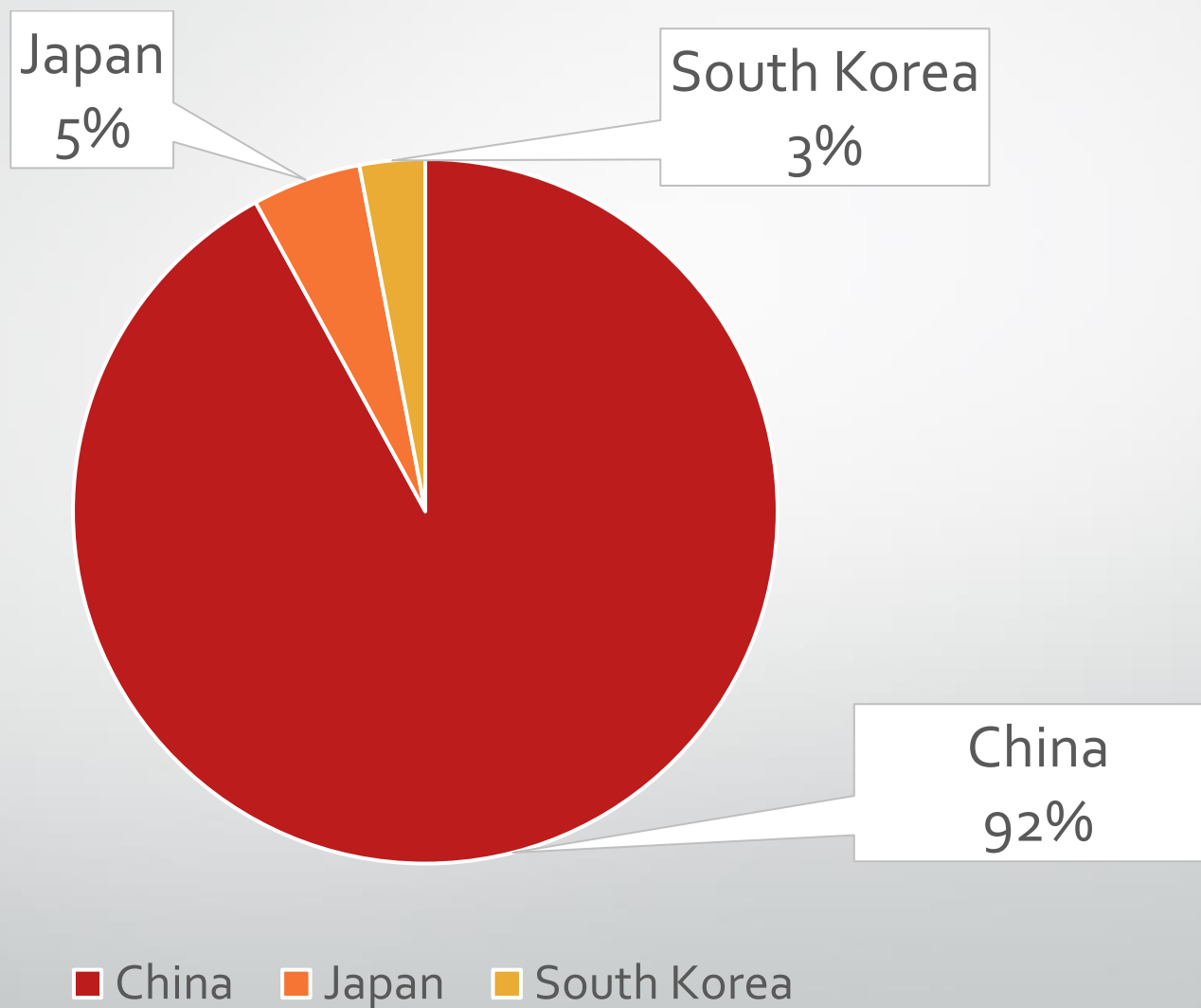
	2021	2022E	2023E	2024E	2025E
Global EV Sales (million units)	6.46	9.2	11.67	14.5	18
China EV Sales (million units)	3.29	4.8	5.94	7.06	8.4
Global Litium Battery Demand (GWh)	419.6	612.9	798.3	1,033	1,357
Power Battery	297	450	591	776	1,020
3C Battery	54.8	62.4	73.6	84	95
Stored Energy	33	56	79	108	168
Others	35	45	55	65	75
Global Anode Material Demand (1,000MT)	570	830	1080	1390	1830
Synthetic Graphite	464	654	841	1088	1429
Natural Graphite	91	149	194	237	293
Silicon	11	25	43	70	110

Note: 1 GWh Litium Batttery requires 1,350MT Anode Materials

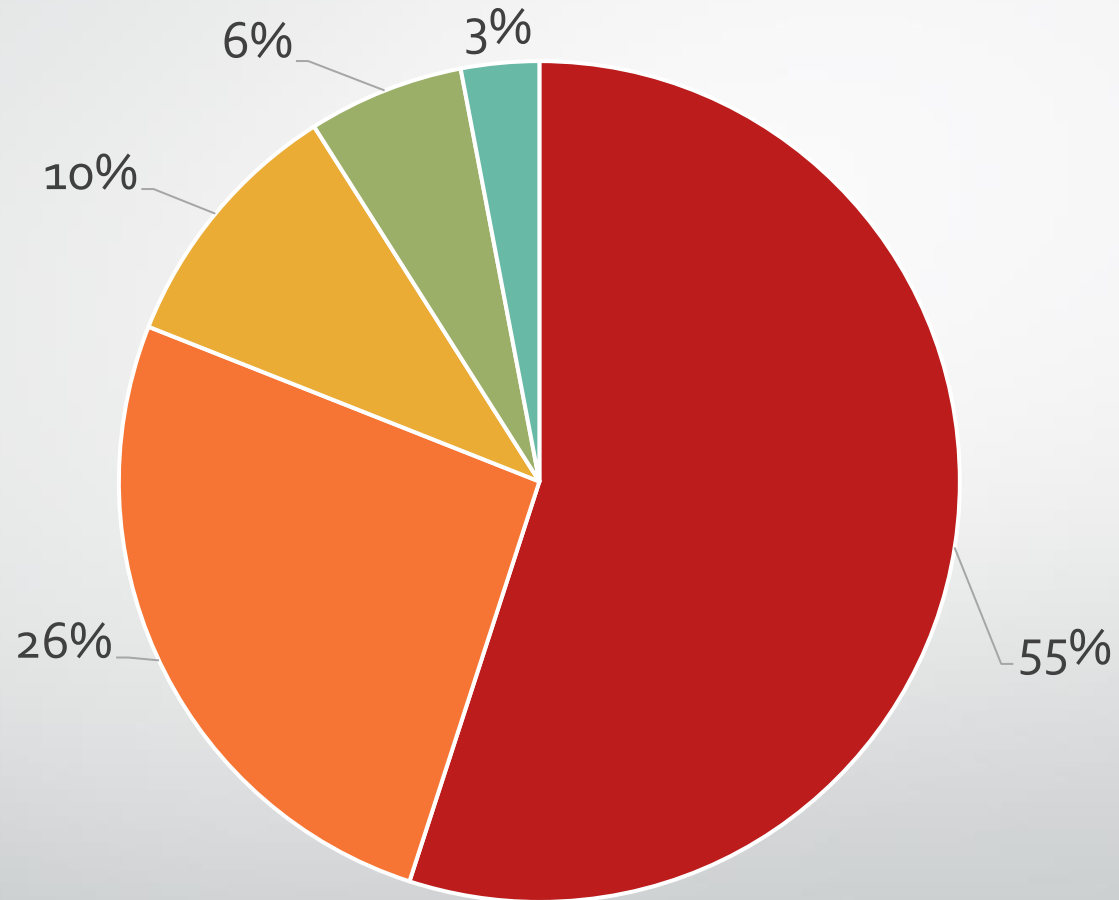
4. Footprints of CATL

- 1. Dec 2011: Company registered
- 2. Jun 2018: Publicly listed in Shenzhen Stock Exchange
- 3. Jul 2019: Cooperation agreement with Toyota
- 4. Oct 2019: Invested in Germany & Signed up with BMW China J/V
- 5. Feb 2020: Supply agreement with Tesla Shanghai
- 6. Oct 2021: Supply agreement with Electric Last Mile Solution Inc., USA
- 7. Nov 2021: Launched high-end EV brand "AVATR" with Chang'an and Huawei
- 8. Jul 2022: Supply agreement with Ford
- 9. Aug 2022: Investment in Hungary

5. 2021 Battery Anode Production, Global

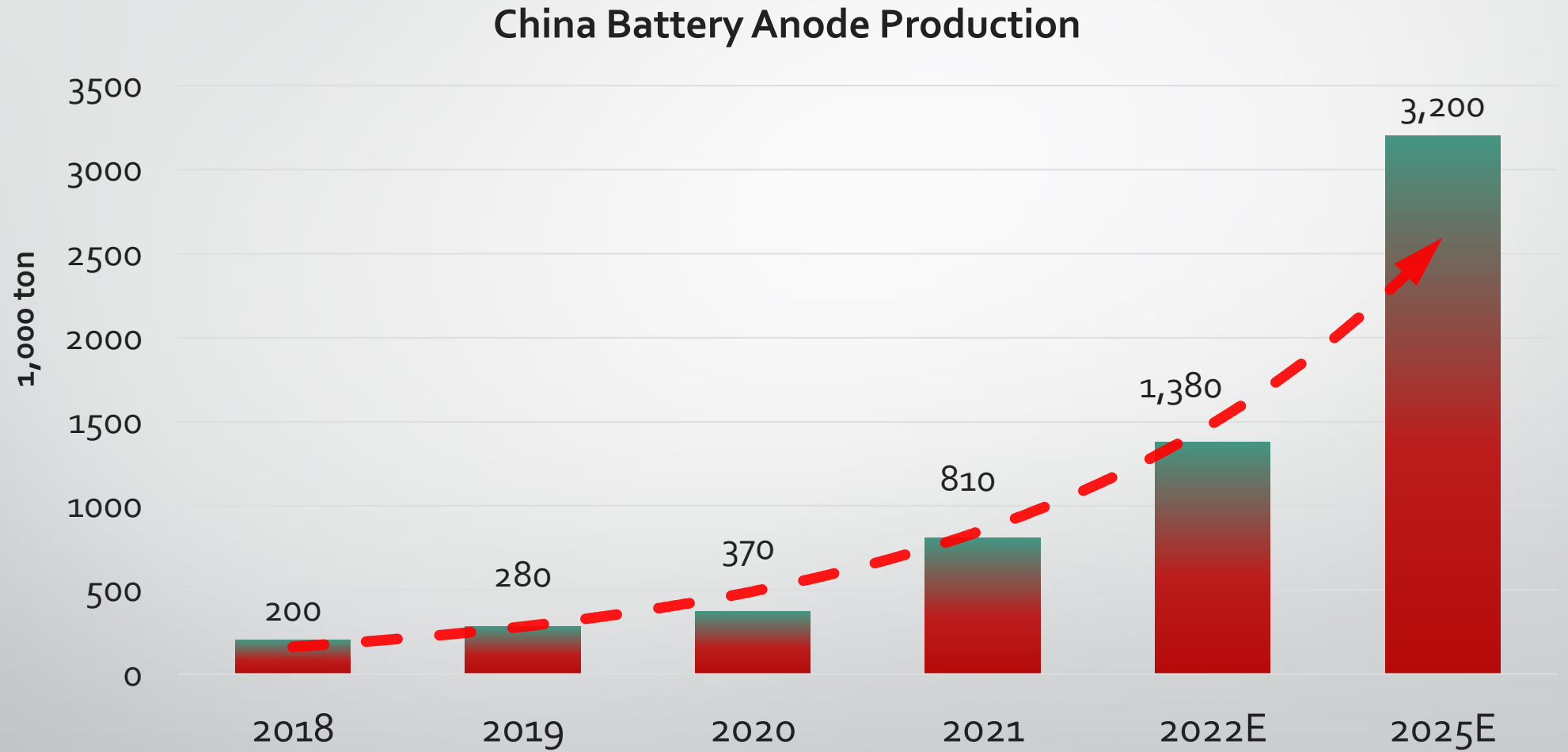


6. 2021 Lithium Battery Market Shares

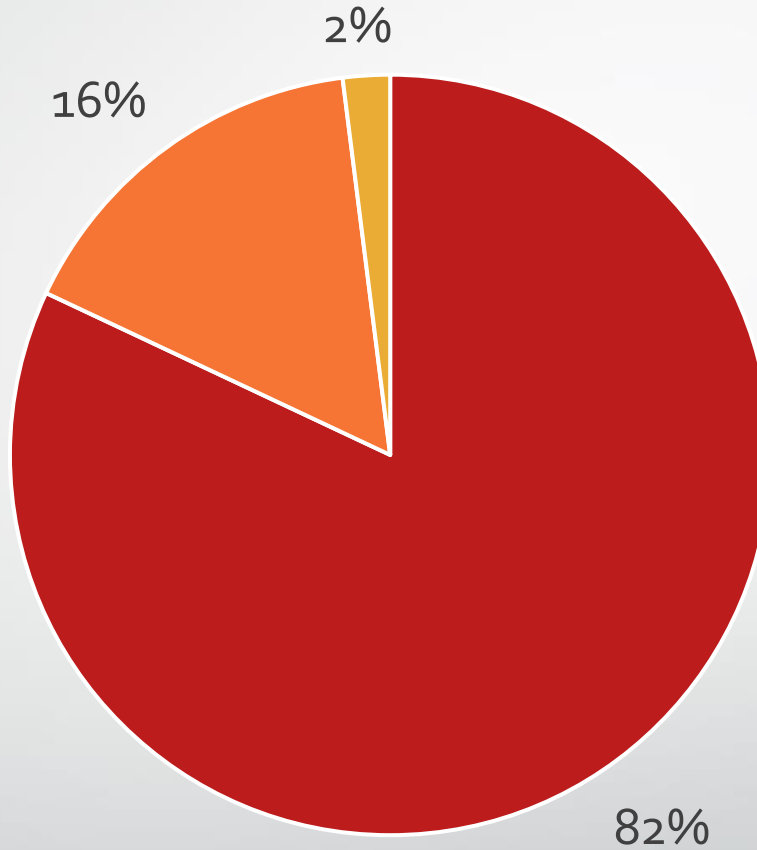


■ Power ■ 3C & others ■ Storage ■ Bicycle ■ Electric Tools

7. Battery Anode Material Production, China



8. Percentage of Different Materials



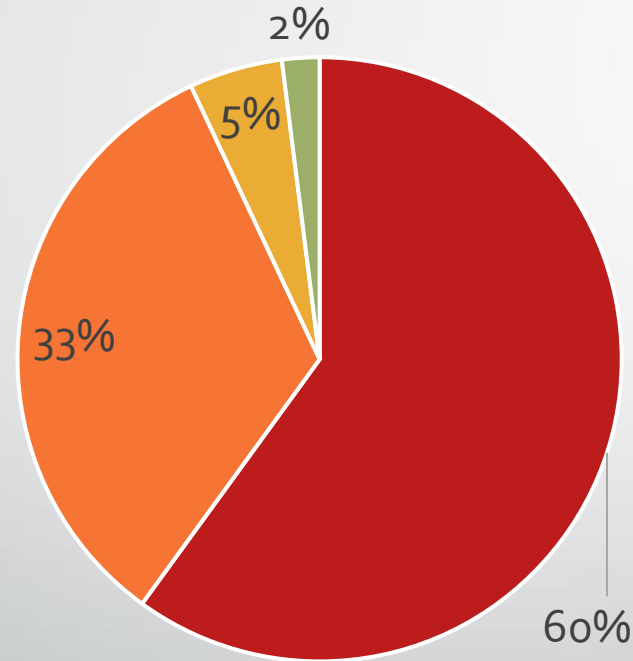
■ Synthetic Graphite ■ Natural Graphite ■ Silicon

9. Synthetic Graphite and Natural Graphite Comparison

	Synthetic	Natural
Feedstock	Pet Coke, Needle Coke, Pitch Coke	Flake Graphite
Processing	Grinding-Granulation-Graphitization-Screening	Purification-Modification-Blending-Carbonization
Capacity (mAh/g)	310-370	340-370
Initial Discharge	90-96%	90-93%
VBD (g/cm ³)	0.8-1.1	0.8-1.2
TBD (g/cm ³)	1.5-1.8	1.6-1.85
Rechargeability	Good (>1,500 times)	Worse (>1,000)
Safety	Good	Worse
Production Cost	Higher	Lower
Pricing	Higher	Lower

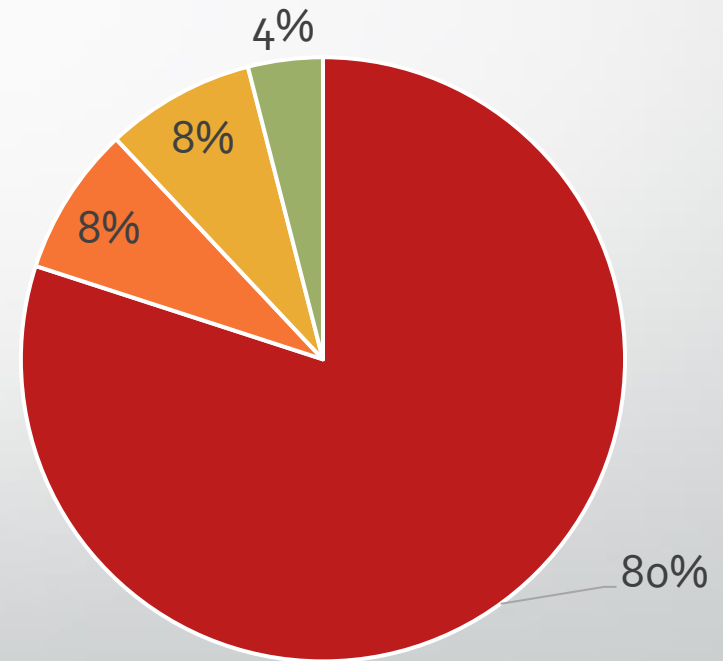
10. Production Cost Comparison

Synthetic Graphite



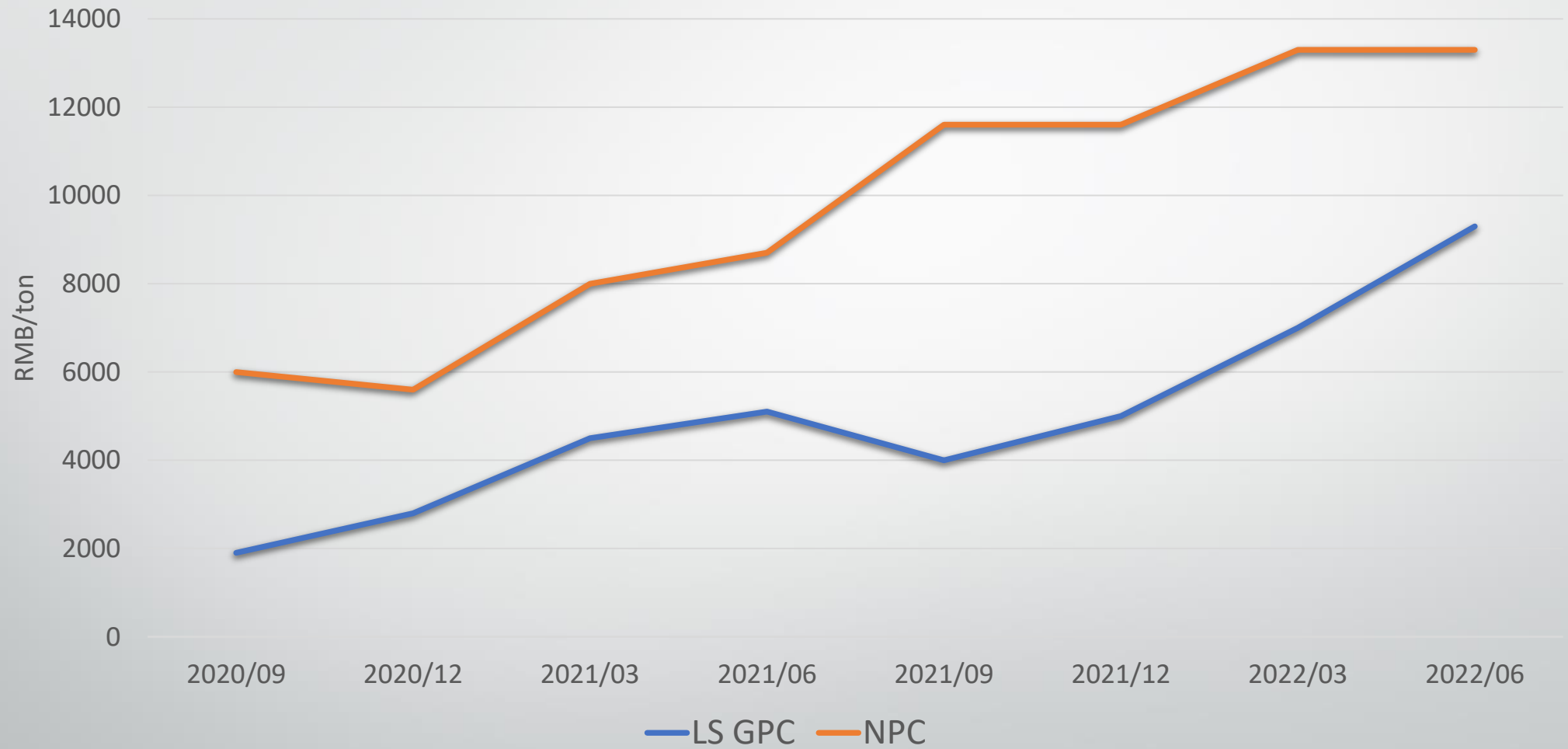
■ Graphitization ■ Feedstock
■ Manufacturing ■ Labor

Natural Graphite



■ Feedstock ■ Manufacturing
■ Carbonization ■ Labor

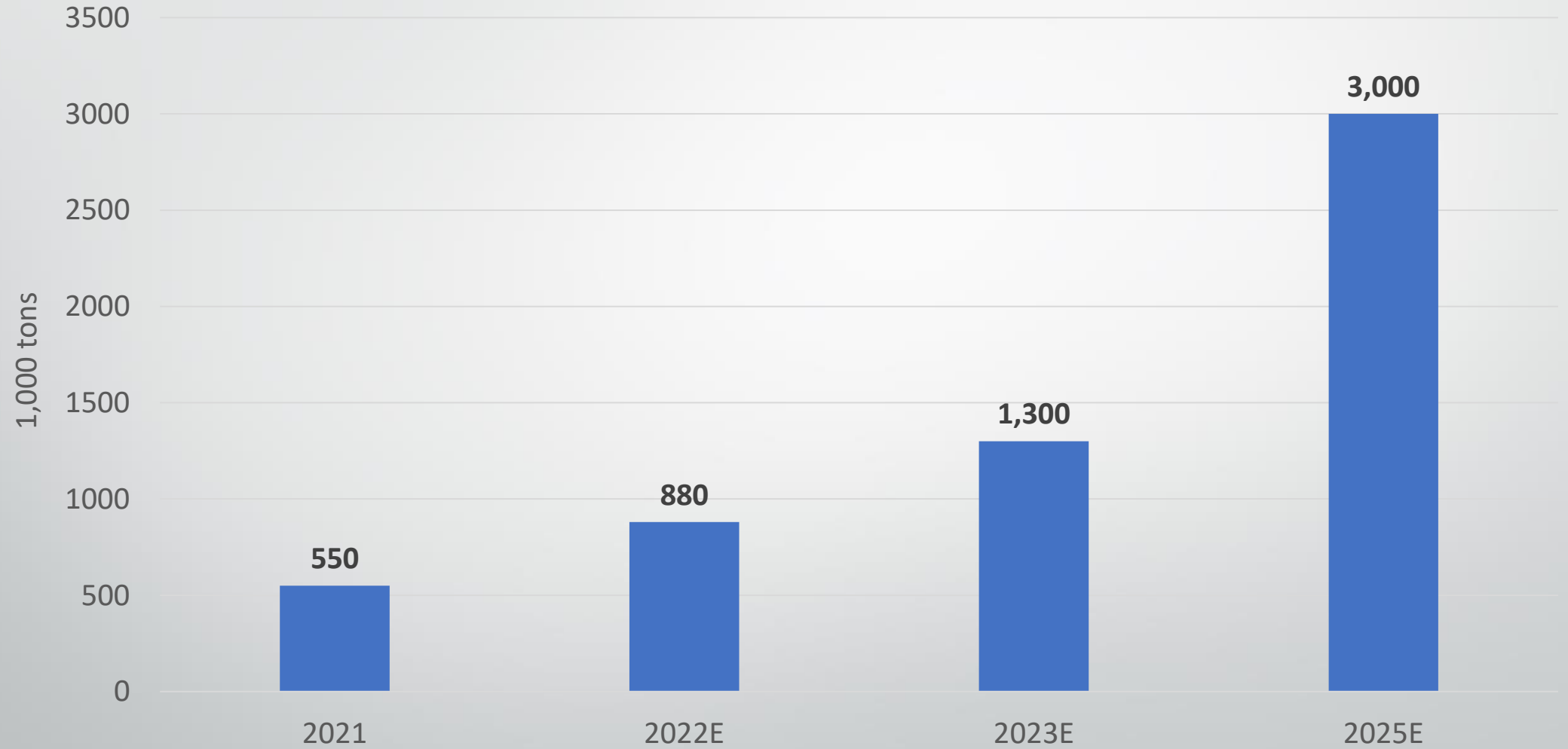
11. Low Sulfur GPC and Needle Coke



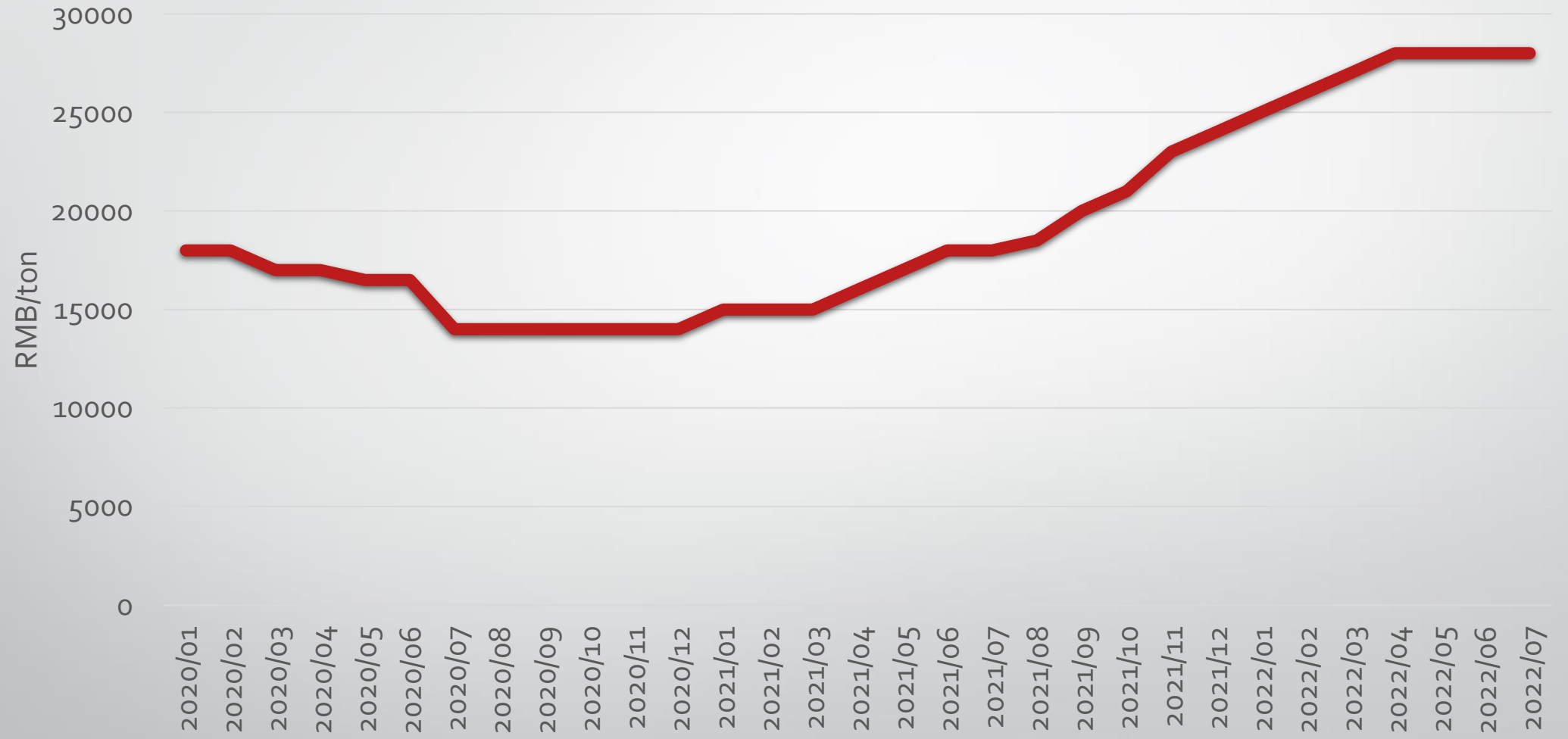
12. Comparison of Different Graphitization Process

	Acheson	Box Type	Continuous
Furnace Placement	Horizontal	Horizontal	Horizontal & Verticle
Capactiy per Batch	20-30 tons	50-60 tons	-
Heating	Ele. Resistance of feestock	Graphite Plates	Graphite Electrode
Temperature (degree C)	3,100	3,050	2,800-3,000
Power Consumption (kWh/t)	10-15,000	7,500-12,500	6-7,000
Production Cycle (days)	20-25	40	-
Daily Output (ton)	1	1.2	-
Graphitziation (%)	96.38%	95.82%	93.73%
Specific Surface Aera (m2/g)	1.92%	2.29%	1.4%
Product Capacity (mAh/g)	353.8	353.1	346.8
Subsidiary Material	Crucible, Packing Material	Packing material	nil
Quality	Stable	Less stable	Less stable
Consistency	Higher	Lower	Lower
Technology	Simple	Difficult	Difficult
Emission	Hard to control	Hard to control	Easy to control

13. Graphitization Capacity



14. Graphitization Pricing



Summary

- 1. EV sales push power battery to grow dramatically
- 2. China taking vast majority of battery anode production
- 3. Production capacity further expands in coming years
- 4. Synthetic graphite leading in supply
- 5. Battery demands driven LSGPC and Needle Coke price hike
- 6. Graphitization facing challenges
- 7. Continuous graphitization technology needs breakthrough

CHINA COAL TAR & COAL TAR PITCH MARKET REPORT

Editor's Message

China-Europe Freight Trains Set New Records

The China-Europe freight train network has set a new record both in the number of freight trains and total freight delivered. Data from China Railway shows the network reached 1,517 operating trains in July with total delivered freight 149,000 TEUs (twenty-foot equivalent units), up 11% and 12% year-on-year, respectively. The transportation network has maintained and operated 1,000 trains per month for 27 consecutive months.

Year to date, a total of 8,990 China-Europe freight trains have been in operation delivering 869,000 TEUs, up 3% and 4% year-on-year. Price advantages and high quality service help the China-Europe freight trains maintain strong development momentum, ensuring the smooth flow of the international industrial and supply chains.

The train volume increase is primarily due to influence of the Russia-Ukraine conflict and the COVID-19 pandemic with rising freight rates. The price of China-Europe freight trains has competitive advantage compared to sea freight prices. In addition, the high-quality services of China-Europe freight trains, with an overseas channel network that is smooth, efficient, multi-directional, and interconnected between land and sea in formation. Statistics show that China-Europe freight trains have reached 200 cities in 24 European countries to date.

**All the best,
Deng Xiaoxing and Zhou Baogang
Editors**

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Thank you!

Deng Xiaoxing
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