Adsorptive separation helps achieve carbon neutrality

of technology development. We expect that by 2030, the domestic demand for PLA will reach 3.4mt, representing a lactic acid purification resin market of at least Rmb1.6bn. The Company has established excellent cooperation with leading domestic PLA producers such as Jindan Lactic Acid Technology and BBCA Biochemical and is strongly positioned to capitalize on incremental demand in the market. The Company is also expected to take up a sizable market share in the BDO purification market (BDO is an upstream material PBAT, another promising biodegradable plastic). In additio
products are increasingly substituting imported counterparts in the life science segment by delivering environmental friendliness and cost reduction at once.

CCUS technology has vast potential with "adsorptive separation" set to benefit from carbon trading

CCUS technology is the most important means to reduce carbon dioxide emissions. According to a forecast of the Department of Science and Technology for Social Development, Ministry of Science and Technology, reach an annual value of more than Rmb330bn by
s
proprietary Seplite-CT polymeric adsorbent product with a macroreticular pore structure has been exported to Europe and other markets. With the continued promotion and expansion of CCUS applications in China, we expect the Company to play an important role in carbon capture and help China to have a bigger say in the global carbon trading system.

Potential risks

1) Significant price volatility of raw materials; 2) intensified industry competition; 3) progress in various business segments missing expectations.

Investment strategy

With carbon neutrality efforts steadily gaining momentum, domestic and overseas NEV markets rapidly expanding, electronic and nuclear grade resins finding increasing applications, and CCUS technology continuing to spread, the Company has entered a phase of rapid growth across segments. We are

2021E-23E earnings forecasts of Rmb323mn/Rmb448mn/Rmb575mn and EPS forecasts of Rmb1.47/2.04/2.62 and reiterate the 2022E target price of Rmb120 (implying 60x 2022E PE with reference to historical valuations of

Item/Year	2019	2020	2021E	2022E	2023E
Operating revenue (Rmb mn)	1,012	923	1,211	1,539	1,958
Operating revenue (YoY,%)	60.1%	-8.8%	31.2%	27.1%	27.3%
Net profit (Rmb mn)	251	202	323	448	575
Net profit (YoY,%)	75.4%	-19.6%	59.8%	38.8%	28.4%
EPS (Rmb, Basic)	1.14	0.92	1.47		

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Adsorptive separation is a promising technology for global carbon neutrality

Carbon neutrality is an important goal for the world in the 21st century

The widespread use of fossil fuels contributes to global warming. Although electricity and oil, as the "new energy" during the second industrial revolution, have brought about a global leap in productivity since the mid-nineteenth century, the accumulation of carbon dioxide in the atmosphere from the burning of fossil fuels has also contributed to a gradual increase in global temperatures. According to the US National Oceanic and Atmospheric Administration (NOAA), the global average temperature has increased by 1°C since 1880, which has triggered a variety of climate anomalies such as the melting of the North and South polar ice caps, local climate change, and frequent extreme weather events. If humans do not limit their carbon emissions, it is expected that the global average temperature will continue to rise by 3°C by 2050, which will cause a significant rise in sea level and have a huge negative impact on the human world.

Fig. 1: Global average temperature, 1880-2020

Source: NOAA

Achieving "carbon neutrality" is critical for addressing global warming. In 1992, the *United Nations Framework Convention on Climate Change* (UNFCCC) was signed, kicking off a concerted global effort to address global warming. Following the signing in 1997 of the *Kyoto Protocol* that set the conservative goal of slowing temperature rise by 0.02-0.28 by 2050, the Paris Agreement was signed by 178 countries in 2015 that commits countries to limit the global average temperatu0.05erl aveglobalvperatu0.05e Ificddri

Adsorptive separation is expected to become an important means to advance carbon neutrality

Achieving "carbon neutrality" depends on: 1) energy transition from fossil energy to clean energy; **2) energy conservation** to reduce the carbon footprint of human activity; **3) the development of carbon sequestration technology**
emissions," which will give China an edge in the upcoming carbon trading market.

Adsorptive separation technology plays an important role in all of the above scenarios. From the energy supply side, adsorptive separation technology can be used to extract and recover energy metals and produce nuclear grade ultrapure water, which can help promote clean energy rapidly; in terms of the intermediate stage, adsorptive separation technology is expected to help the production of bio-based degradable plastics such as PLA and reduce the carbon footprint of petroleum-based degradable

levels in 2020. The world has entered a period of rapid explosion in demand for lithium batteries.

Fig. 5: Domestic NEV production (10k vehicles)

Fig. 6: Global lithium battery installed capacity forecast (GWh)

Source: CAAM, CITICS Research forecast

from the former requires energy-intensive and high-pollution processes such as calci

	Adsorption method	Precipitation method	Membrane method	Extraction method
	Jintai Lithium, etc.		HXR Lithium, etc.	
Salt lakes	Chaerhan Salt Lake	Atacama Salt Lake, Olaroz Salt Lake, etc.	Dong Taijinaier, Xi Taijinaier, Yiliping	Da Qaidam Salt Lake, Balun Mahai Lake

Source: "Research and development of lithium brine extraction technology" (LIU Dongfan, SUN Shuying, YU Jianguo), CITICS Research

Lithium brine extraction represents a market of over Rmb10bn in China. We estimate the size of the domestic market of lithium extraction from salt-lake brine from two dimensions:

Emerging technologies highlight the importance of gallium. Gallium compounds are widely used in magnets, LEDs, photovoltaics, RF, switches, etc, especially in consumer electronics, which has an intensive use of many emerging technologies that use gallium. For example, Apple has now equipped its Display Pro XDR, iPad Pro and Macbook Pro products with mini-LED display, in which the LED material must use gallium element. And gallium nitride chargers are also common today, which deliver a charging capacity of more than 100W for faster smartphone charging.

Fig. 11: Gallium-containing mini-LED panel used in iPad Pro

Source: Apple website

Gallium extraction is a mature and profitable segment of Sunresin. The Company has been engaged in gallium extraction for many years and won the second prize of

Fig. 12

Source: Wind, CITICS Research

Sunresin's adsorptive separation technology thrives in hydrometallurgical applications across key metals. The Company's hydrometallurgy technology is capable of extracting relevant energy metals such as nickel, cobalt, vanadium and uranium, of which the nickel extraction technology has been granted multiple patents. The Company's nickel and cobalt projects are being actively promoted and are expected to replicate the Company's business model in the salt lake lithium extraction segment to become new sources of profit growth. The uranium extraction segment is also expected to usher in a period of high growth amid the rapid development of nuclear power in China.

Table 9

Metal	Progress
Nickel	The Company's high-efficiency nickel adsorbent reached the best levels reported by international companies in the performance test of nickel ore in East Asia. With proprietary processes, it has provided nearly Rmb40mn worth of integrated solutions consisting of adsorbent materials and system equipment for overseas customers.
Cobalt	-based project is currently in the stage of equipment installation, with the start of production expected in 2022. The project is expected to play a demonstration role and help the Company secure contracts from other cobalt mines in the DRC.
Uranium	Stable annual supply for African mines
Gold	Stable supply of adsorbents worth over Rmb1mn for Europe and Africa

Fig. 14: Schematic of ultrapure water production within a power plant (blue and green for cation and anion exchange resin, respectively)

Electronic and nuclear grade ultrapure water requires ion exchange resins with high uniformity. Uniform particle size (UPS) resins have unique hydrodynamic properties and exhibit unique properties such as singular and full operational efficiency during the exchange and regeneration of the resin. With outstanding performance for applications in specific industries, they are currently the only choice for producing

Brand	DuPont	Sunresin	Comparison
Hydrogen-oxygen form rate (%)	-	-	Flat
Delta TOC (ppb)			Excellent

Source: Each company announcement, CITICS Research Cation resin = H; Anion resin = OH

Electronic grade resins for ultrapure water production are set to boom with the semiconductor industry

to reach US$384mn by 2030. Considering that the basically 1/4 of that of the semiconductor industry chain, that display and semiconductor resins are close in process and cost, and that the display industry is also in the eve of a big boom of mini-LED and micro-LED displays, we expect resin demand from the display industry to reach Rmb100mn by 2030. In other words, the entire electronic grade resin market size will reach c. US$400mn. **Electronic grade resin is one of the most difficult types to produce among all adsorbent resins, and its supply follows a standard procedure. Sunresin is already working with enterprises including BOE Technology on product verification, and if things go well, it is expected to quickly achieve import substitution and gain an immense headroom for growth.**

Table 11: Ultrapure water and ion exchange resin demand from semiconductor industry, 2017-2030E

Item	2017	2018	2019	2020	2021E	2022E	2025E	2030E
Global wafer shipping area (mn square inches)	11,810	12,732	11,810	12,407	14,350	15,758	21,174	33,837
Ultrapure water demand per square inch of wafer (m^3)	0.1013	0.1013	0.1013	0.1013	0.1013	0.1013	0.1013	0.1013
Semiconductor industry ultrapure water demand (mn m^3)	1,196.35	1,289.75	1,196.35	1,256.83	1,453.66	1,599.02	2,144.93	3,427.64
Resin demand per tonne of water (10-6 m^3)	7.716	7.716	7.716	7.716	7.716	7.716	7.716	7.716
Global resin demand (m^3/year)	9,231.06	9,951.72	9,231.06	9,697.69	11,216.40	12,338.04	16,550.25	26,447.69
Global resin market (US$100mn/year)	1.35	1.45	1.35	1.41	1.63	1.79	2.41	3.84

Fig. 17: Nuclear power production by country in 2020 (TWh)

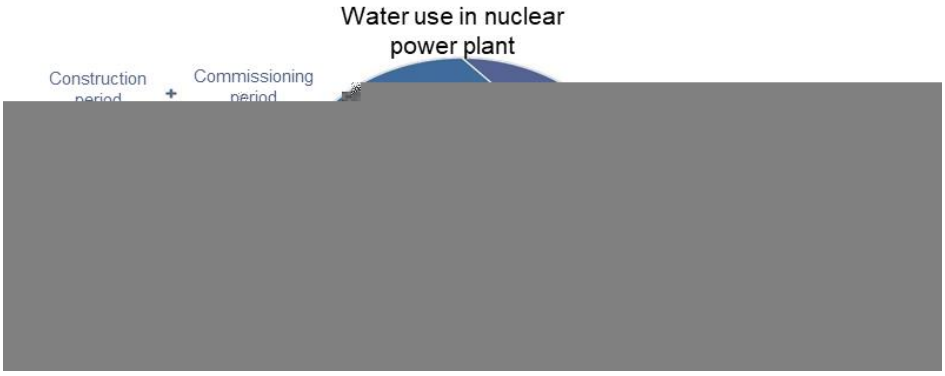
Source: Wind, CITICS Research

Nuclear power construction during the 13th FYP period missed expectations. According to the *Mid-*

used in the feedwater and water treatment systems of the first and second circuits of reactors. The supply of reliable ultrapure water to the second circuit of the steam

to provide steam of acceptable quality. Nuclear grade ultrapure water can reduce fouling on the second circuit, reduce thermal resistance to heat transfer from the first circuit to the second circuit, and increase steam production, in addition to reducing fouling deposits on the generator turbine blades. Moreover, nuclear grade resins that are applied to the first circuit water treatment system in nuclear power plants must have a high regeneration and transformation rate, very low impurity content, good resistance to irradiation decomposition, and ability to operate at higher operating flow rates and rather high temperatures, and the reactions of organic or inorganic impurities released from the system during use must be within allowable limits.

Fig. 18: Schematic of the primary pipes of China's homegrown third-generation nuclear reactor



Source: "Failure analysis and modification of desalination water system in Tianwan Nuclear Power Plant" (TAN Mingyu)

The domestic nuclear grade ultrapure water adsorbent resin market is expected to reach Rmb1.8bn by 2030, from which the Company stands well to benefit. Referring to the assumptions in our previously published report, *Sunresin New Materials (300487.SZ) In-depth Tracking Report: R&D-driven rapid growth across resin segments* (4 Jun 2020), we forecast that domestic nuclear power installed power rating will reach 110mn kWh, representing a nuclear grade ultrapure water resin market of c. Rmb1.2bn by 2030, and it will reach Rmb1.8bn if the replacement cycle of resin is taken into account. Sunresin is one of the few domestic nuclear grade ultrapure water resin suppliers and maintains cooperation with multiple nuclear power related enterprises. Compared with leading foreign companies, it has advantages in terms of supply cycle, supply stability and prices and its products are expected to rapidly replace their imported counterparts.

Table 12: Domestic nuclear grade resin market size, 2018-2030E

Item	2018	2019	2020	2030E
Number of nuclear power units	45	47	51	110
Installed nuclear power capacity (10^8 W)	459	487	510	1,100
Demand for desalinated water per GW of nuclear power capacity (m^3/s*GW)	0.0037	0.0037	0.0037	0.0037
Nuclear for ultrapure water (106 m^3/year)	5.35	5.69	5.94	12.82

Item	2018	2019	2020	2030E
Resin demand per tonne of ultrapure water (m^3)	0.012	0.012	0.012	0.012

It2018

2

Fig. 19: Domestic plastic and chemical fiber production and GDP per capita (10kt, US$)

Source: Wind, CITICS Research

Fig. 20: Domestic plastic and chemical fiber production and per capita GDP growth

Source: Wind, CITICS Research

The policy promotes degradable plastics. China has introduced three phases of restrictions on the production, sale and use of disposable plastics by 2020, 2022 and 2025, respectively. Currently, the production and sale of ultra-thin plastic shopping bags less than 0.025 mm thick and polyethylene agricultural film less than 0.01 mm thick have been banned. Increased prohibitions will be imposed on plastic express delivery packaging materials by 2022 and disposable tableware by 2025.

Table 13: China's laws and regulations on single-use plastics

Laws and regulations	Type

Laws and regulations	Type	Stipulations
		Production of daily chemical products containing plastic microbeads should be prohibited. By the end of 2022, the sale of daily chemical products containing plastic microbeads should be banned.
		Non-degradable plastic bags. By the end of 2020, non-biodegradable plastic bags should be prohibited in shopping malls, supermarkets, pharmacies, bookstores and other places in urban built-up areas of centrally-administered municipalities, provincial capitals and cities specifically designated in the state plan, as well as catering packing take-out services and various exhibition activities; and bazaars should regulate and limit the use of non-biodegradable plastic bags. By the end of 2022, the implementation scope should be expanded to all urban built-up areas of cities at and above the prefecture-level and built-up areas of counties in coastal areas. By the end of 2025, trade markets in these areas will ban the use of non-biodegradable plastic bags. Regions, where conditions permit, are encouraged to stop the use of non-degradable plastic bags at trade markets in rural-urban fringe, towns, and rural areas.
		Disposable plastic tableware. By the end of 2020, non-degradable disposable plastic straw should be prohibited from use in the catering industry nationwide; and non-degradable disposable plastic tableware should be prohibited from use in the catering industry in urban built-up areas and scenic spots at prefecture-level or above. By the end of 2022, it is prohibited from using non-biodegradable disposable plastic tableware in the county built-up areas, and for scenic spots catering services. By 2025, the consumption intensity of non-biodegradable disposable plastic tableware will drop by 30% in catering takeaway in cities above the prefecture-level.
		Plastic packaging for express delivery. By the end of 2022, postal and express delivery outlets in provinces and cities such as Beijing, Shanghai, Jiangsu, Zhejiang, Fujian and Guangdong will be prohibited from using non-degradable plastic packaging bags, and disposable plastic woven bags, and should reduce the use of non-degradable plastic tape. By the end of 2025, non-degradable plastic packaging bags, plastic tapes, and disposable plastic woven bags are prohibited from use in postal and express delivery outlets nationwide.
	Restriction	Disposable plastic products for hotels and restaurants. By the end of 2022, star hotels, restaurants and other venues nationwide will no longer provide disposable plastic products on their initiative, and may provide the relevant services by setting up self-service purchasers and providing rechargeable detergents or otherwise. By the end of 2025, the implementation scope will be expanded to all hotels, restaurants, and residential accommodations.
Notice on Solid Promotion of Plastic Pollution Control	Prohibition	Strengthen the supervision and inspection of plastic products prohibited from production and sale. Local market supervision departments shall carry out quality supervision and inspection of plastic products and investigate and persecute the production and sale of ultra-thin plastic shopping bags less than 0.025 mm thick and polyethylene agricultural plastic films less than 0.01 mm thick according to law; and carry out law enforcement of disposable foaming plastic tableware, disposable plastic cotton swabs and daily chemical products containing plastic microbeads that are included in the catalogue of products to be phased out according to the prohibition deadline specified in the Opinions. Local industry and information technology departments shall, in conjunction with relevant departments and in accordance with the requirements of local government deployments, out and guide the relevant enterprises to adjust production in a timely way.

Laws and regulations	Type	Stipulations

Item	2017	2018	2019	2020	Annual growth	2021E	2025E	2030E

the capacity under construction and proposed to be built has reached 1.5mtpa. The refining process is particularly important in the production of lactic acid, which requires the use of resin to remove heavy metals, proteins, pigments and other impurities from the fermentation broth to obtain lactic acid products of different grades, such as food grade, refined grade and high purity grade, of which high purity grade lactic acid is mainly used in the production of PLA. Sunresin has deep expertise in food processing and has secured orders from leading PLA producers such as Jindan Lactic Acid Technology and BBCA Biochemical.

Table 16: Major PLA producers (10ktpa)

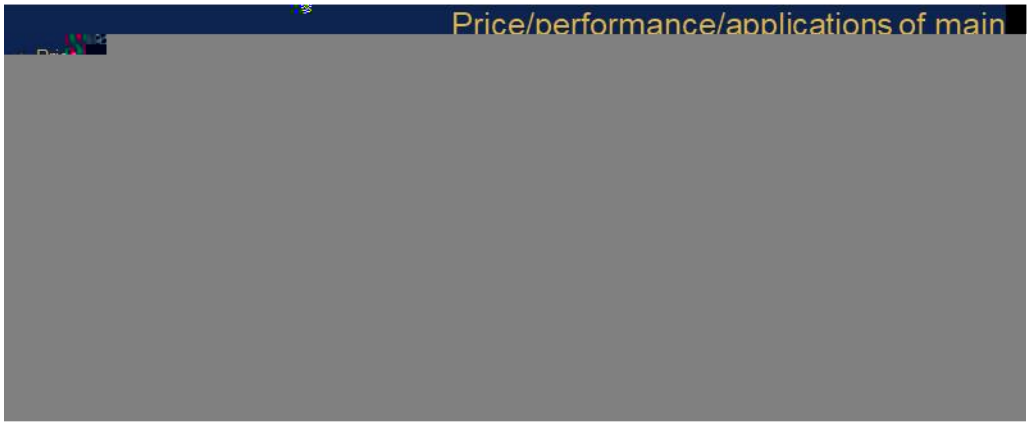
Company	Jindan Lactic Acid Technology	Kingfa Sci & Tech	BBCA Biochemical	Hisun Biomaterials	COFCO Biotechnology
Capacity	Lactic acid: 12.8 Lactide: 1 Polylactic acid: 0.1	-	Lactic acid: 15 Polylactic acid: 10	Polylactic acid: 6.5	Polylactic acid: 3
Capacity under construction	High gloss pure lactic acid: 5 Polylactic acid: 1	Polylactic acid: 3	Lactic acid: 50 Polylactic acid: 30	Polylactic acid: 15	Polylactic acid: 10

Source: Company announcement, CITICS Research

Lactic acid purification opens up an adsorbent resin market valued in the hundreds of millions of RMB. We expect that the penetration rate of PLA in degradable plastics will reach 40% and 50% in 2025 and 2030, respectively, corresponding to a PLA demand of 1.3mt and 3.4mt. According to our research, each 10kt of lactic acid production requires c. 40m^3 of adsorbent resin for purification. Assuming the average price of resin at 80 RMB per liter, it will represent a market of Rmb600mn for adsorbent resin by 2025 and Rmb1.6bn by 2030, making adsorbent resin for purification another high-quality business segment of Sunresin.

With performance and other factors considered, PLA+PBAT is the mainstream direction of biodegradable plastics at present. Although PLA has high strength, good thermoplasticity and good biocompatibility and is more in line with the direction of carbon emissions reduction, it is brittle and has poor thermal stability, weaknesses that can be well complemented by PBAT that has good ductility, impact resistance and thermal stability and is often used to toughen other brittle plastics. The current mainstream degradable material solution in the market is to co-extrude PLA and PBAT (to integrate their hardness and brittleness properties). It is expected that the share of degradable plastics will exceed 60% by 2025 and rise further by 2030.

Fig. 23: Price/performance comparison of common biodegradable plastics



Source: "Development and trends of biodegradable plastics" (LU Haixu)

Domestic PBAT capacity expansion drives up demand for upstream raw material BDO. According to industrysourcing.cn, the domestic PBAT production capacity was only 293ktpa in 2020, but the capacity under construction for the period from 2021 to 2023 exceeds 4mt. At present, PBAT is mainly prepared using the direct esterification process in China, with upstream core materials including terephthalic acid (PTA), adipic acid (AA) and 1,4-butanediol (BDO). The BDO consumption per unit of PBAT is between 0.5 and 0.6. Based on the unit consumption of 0.55, it is expected that the new capacity under construction from 2021 to 2023 will have a BDO demand of c. 2.3mt.

Table 17: Domestic PBAT capacity and layout (as of Nov 2021)

Company	Existing capacity	Capacity under construction	Commissioning/planned commissioning	Planned capacity
Xinjiang Blue Ridge Tunhe Chemical Industry Co., Ltd.	13		2020	24

Company	Existing capacity	Capacity under construction	Commissioning/planned commissioning	Planned capacity
Jiangsu Sanfame Co., Ltd.		4		12
Hubei Yihua Chemical Industry Co., Ltd.		6		

Inner Mongolia Guangju	Wuhai, Inner Mongolia	-	12	-
Hualu Hengsheng Chemical	Dezhou, Shandong	-	18	2021-2023
Sanwei Holding	Wuhai, Inner Mongolia	Acetylene-formaldehyde process	90	Dec 2026
Dongjing Biological	Wuhai, Inner Mongolia	Hong Kong Guanda acetylene-formaldehyde process	20	Jun[ )]TJETQ2
Shenghong Petrochemical	Lianyungang, Jiangsu	Maleic anhydride process	30	-
Wuheng Chemical	Ningdong, Ningxia	-	2x11.6	Commissioned in early Jul TJETQ2
Henan Energy Xinjiang	Baicheng County, Xinjiang	-	20	-
Foryou Corporation	Taiyuan, Shanxi	Acetylene-formaldehyde process	30	-
Zhongke Qicheng	Zhumadian, Henan	Acetylene production from natural gas by acetylene-formaldehyde process	20	-
Shandong Tianyi		Maleic anhydride process	5.2ETQ5	Construction period from TJETQ2 to TJET
Inner Mongolia Jiutai	Hohhot, Inner Mongolia	Acetylene-formaldehyde process	30	-
Zhongguan Petrochemical	Zhuhai, Guangdong	Maleic anhydride process	10	-

involves intensive use of toxic and harmful reagents and the emission of a large amount of organic and metal waste, which is harmful to the environment and human health. In contrast, the enzymatic process is simpler and safer, more environmentally friendly and less costly than the chemical process. Therefore, domestic producers adopting the chemical process lack a competitive advantage compared with overseas.

The Company has successfully achieved the enzymatic preparation of 7-ACA, which increases the global competitiveness of its 7-ACA products. Sunresin Technology has been conducting research on enzyme carrier technology for enzymatic production of 7-ACA since 2005 and has cooperated with domestic 7-

Technology Achievements. The Company's Seplite®LXQ resin and Sepsolut® integrated VOC treatment system has been validated by multiple enterprises to deliver an adsorption and removal rate of more than 99.9% for chlorinated volatile organic compounds. Boasting higher safety, greater stability, high precision, long life, high recovery rate, and the ability to recover lost raw materials and solvents while meeting emissions standards, the technology has become a powerful tool in the field of VOC treatment.

New plants will sol753163

Table 22 -2023E

Item/Year	2019	2020	2021E	2022E	2023E
Operating revenue (Rmb mn)	1,012	923	1,211	1,539	1,958
Operating revenue (YoY,%)	60.1%	-8.8%	31.2%	27.1%	27.3%
Net profit (Rmb mn)	251	202	323	448	575
Net profit (YoY,%)	75.4%	-19.6%	59.8%	38.8%	28.4%
EPS (Rmb, Basic)	1.14	0.92	1.47	2.04	2.62
Gross margin	49.8%	46.6%	47.4%	48.3%	48.8%
ROE (%)	19.9%	12.2%	15.1%	17.8%	19.2%
BVPS (Rmb)	5.74	7.51	9.73	11.46	13.65
PE (x)	94.5	104.6	65.4	47.2	36.7
PB (x)	18.8	12.8	9.9	8.4	7.0

Source: Wind, CITICS Research forecast Note: Closing price as of 27 Jan 2022

Valuation and rating

1) PE valuation

Comparable companies in the industry are valued at an average PE of 57x in 2022. We identify Zhengguang Industrial, Jiuwu Hi-Tech and Nanomicro Technology as comparable companies, whose average PE in 2022 is 57x according to Wind consensus estimates.

Table 23: Valuation of Sunresin vs. comparable companies, 2020-2023E

Ticker	Company	Share price	EPS				PE (x)			
			2020	2021E	2022E	2023E	2020	2021E	2022E	2023E
301092	Zhengguang Industrial	34.00	1.27	1.00	1.21	1.58	-	34.0	28.1	21.5
300631	Jiuwu Hi-Tech	33.56	0.76	0.70	1.02	1.36	22.74	49.0	33.7	25.4
688690	Nanomicro Technology	63.55	0.20	0.35	0.57	0.85	-	174.3	110.0	73.7
Average								85.8	57.3	40.2
300487	Sunresin New Materials	96.19	0.94	1.47	2.04	2.62	92.9	65.4	47.2	36.7

Source: Wind, CITICS Research forecast Note: Closing prices as of 27 Jan 2021; EPS forecasts for comparable companies are Wind consensus estimates

2) Vertical PE valuation

The Company's average PE over the past 5 years is 50x. The Company's PE (TTM) from 2016 to the present time is 50x with a mean ±1 standard deviation PE range of 34x-67x. Anticipating high growth of earnings and continued valuation matching in the next 2-3 years thanks to capacity ramp-up and increasing penetration in the downstream

ion as reference, we assign the Company 67x 2022 PE.

Income Statement					(RMB mn)
Indicator	2019	2020	2021E	2022E	2023E