HUA YANG INDUSTRY

Mass Production Applications of Mixed Glass Fiber Pasting Paper & Breakthrough Research on Glass Fiber Separators for Sodium-ion Batteries

Sophia Du
GM of Hua Yang

CONTENTS

1 Who we are?

Hua Yang Production Since 1992

-Global AGM Whole Industry Chain Producer-

AGM
Whole Industry Chain
Producer

HUA YANG INDUSTRY

Trust In Future.

Glass Blocks

Glass Fiber

AGM Separator

Hua Yang
North Factory

Hua Yang
Shan Dong Factory

Hua Yang
Indonesia Factory

Industry Chain, Good AGM;
Good AGM, Hua Yang Make.

33 Years

2 Genaration

We build a proud AGM whole industrial chain


AMARA RAJA
Gotta be a better way
EXIDE
双登集团
SHUANGDENG GROUP
CSIC
Sail
风帆股份
HANKOOK
AtlasBX
超威集团
CHILWEE
MONBAT
BATTERIES
Banner
THE POWER COMPANY
天能集团
TIANNENG GROUP
newmax
PANNA
GROUP
WALTON
凯捷国际
KAGE GROUP
HYUNDAI SUNGWOO HOLDINGS
SCB
SHENG CHANG TECH CO.,LTD
SEBANG
12 Countries, More Than 100 Customers.
Tia Sang
RAHIMAFROOZ
Enriching Lives with Your Trust
奥冠电池
ALLGRAND BATTERY
BATTERY
CSB
海德森
HaiDeSen
MICROTEX
PT.SELATAN JADI JAYA
AUTOMOTIVE BATTERY
CSSC 淄博火炬能源
LEOCH
理士電池
Leoch Battery
cane 康洋
宏基电源
GREAT-BASE
Narada 南都
美华电池
MeiHua Battery
创耐电池
赣州市创翔电源
JCG
JAYACHANDRAN
GROUP OF COMPANIES

Battery Types in Different Countries

Chinese Market

EV, Communication, Energy Storage, Motorcycle,Vehicle Start-stop, UPS Lead-carbon, Industry

Indonesian Market

Motorcycle

Korean Market

Vehicle Start-stop, UPS

Bulgarian Market

Vehicle start-stop, Four-wheel vehicle, Communication, Energy Storage,

Indian Market

Communication, Motorcycle, UPS

Austrian Market

Vehicle start-stop

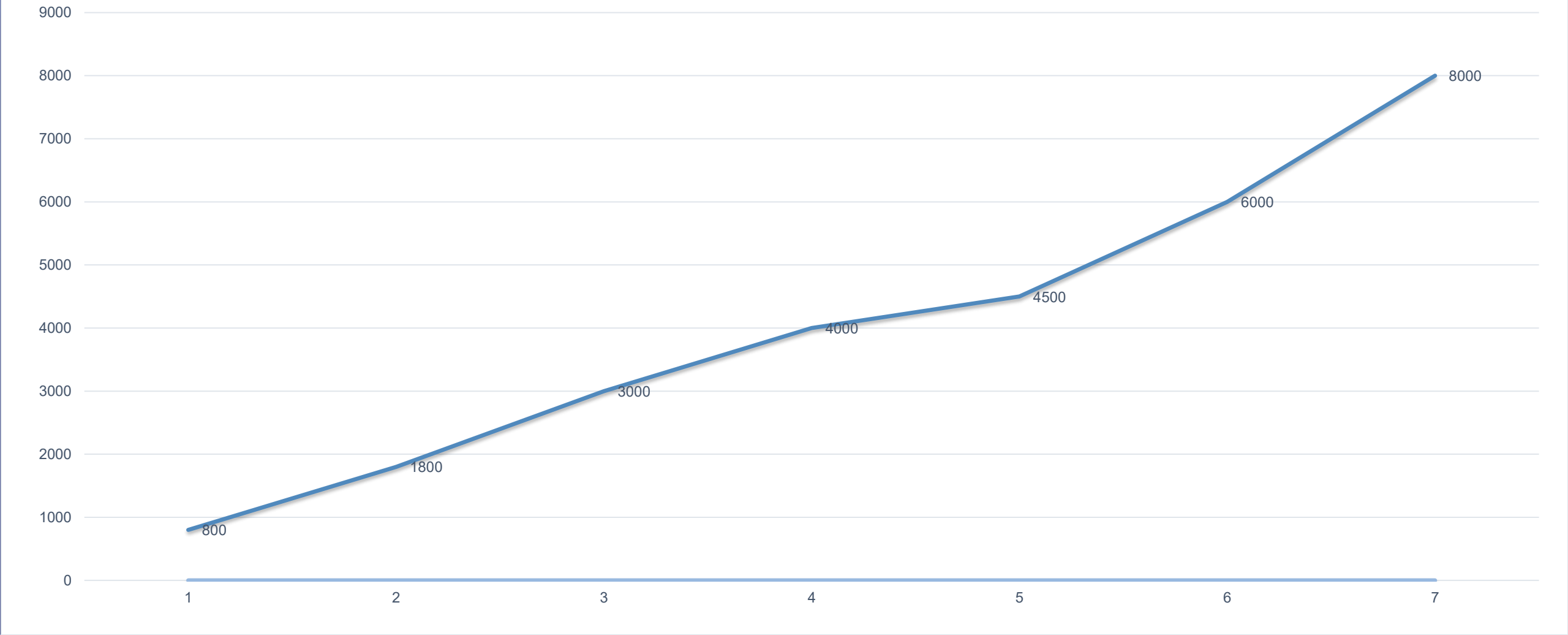
Tanzania Market

Motorcycle, UPS

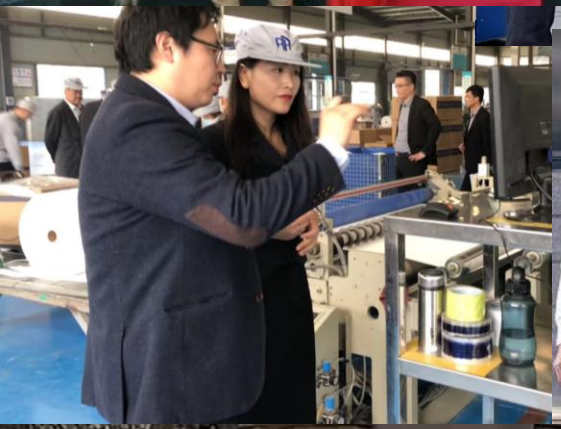
Uganda Market

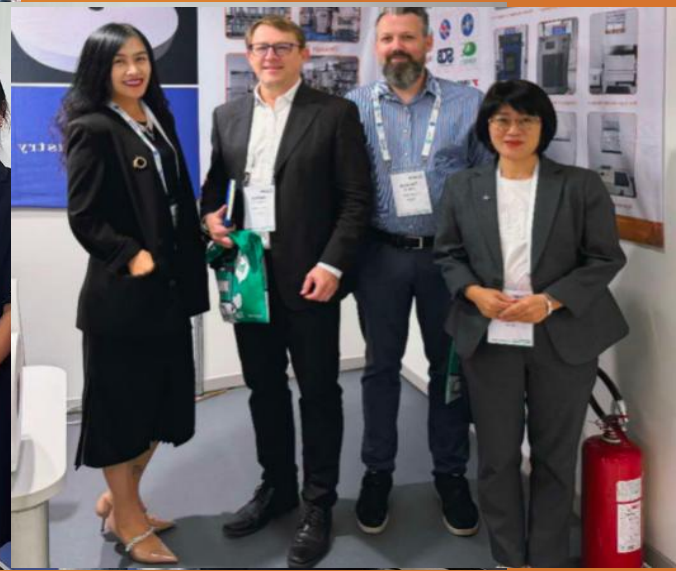
Motorcycle, UPS

Trend of Huayang's Production Capacity Growth from 2011 to 2025



Our products, our life.





By AGM, Hua Yang connected the the whole world.

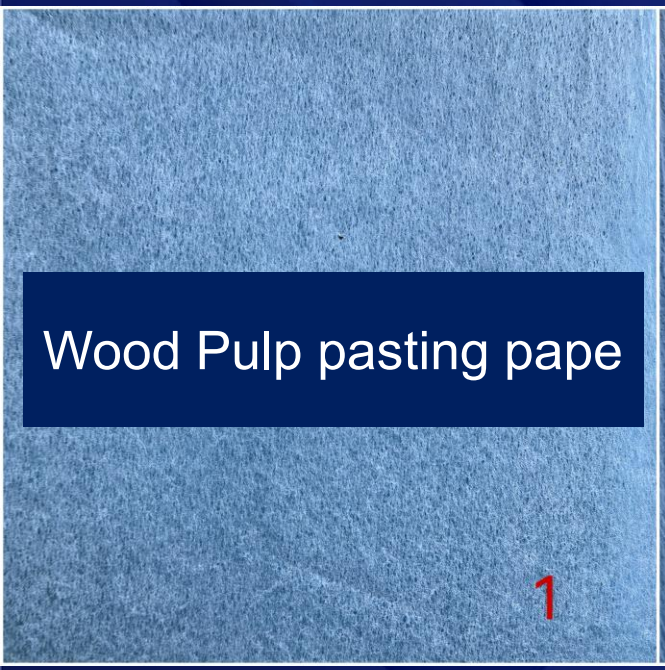
Hua Yang AGM Insist on dreams

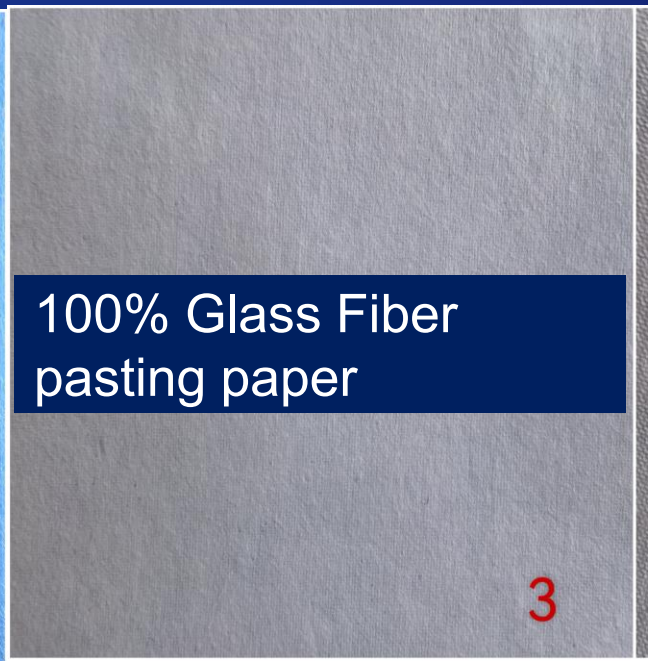
The eternal future "Lead" Hua Yang rises.

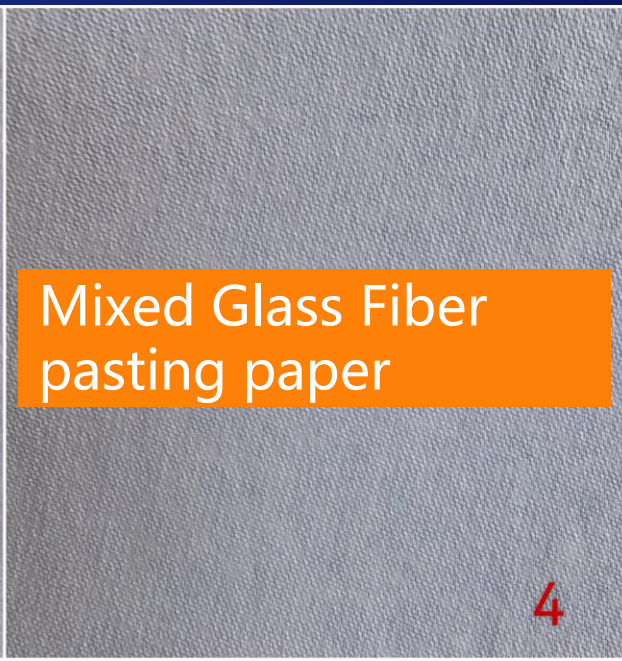
2

Hua Yang New Product
—Mixed Glass Fiber Pasting Paper

Types of Pasting Paper





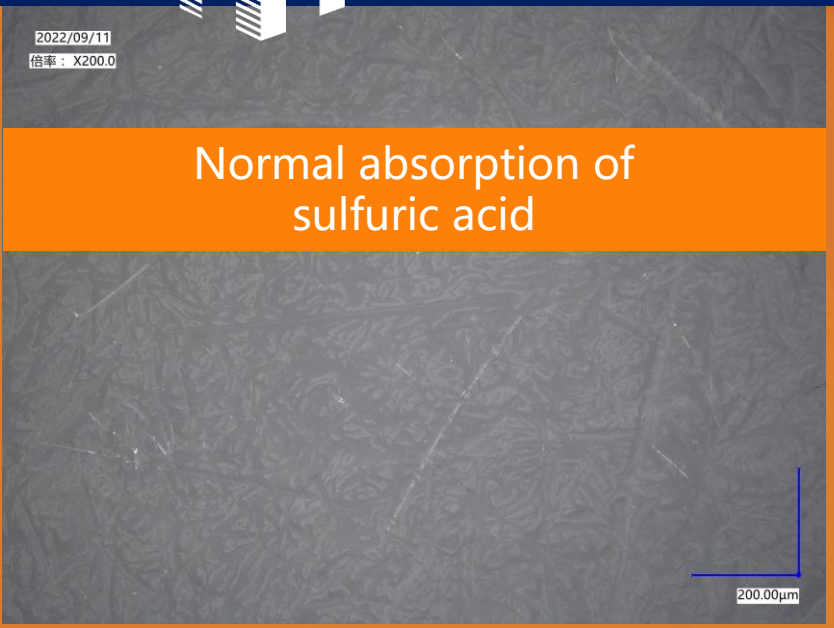


Disadvantages of Wood Pulp pasting paper

After directly assembled the positive plate,
Due to the corrosiveness of sulfuric acid,
the wood pulp paper undergoes
a dehydration reaction.
The carbonized wood pulp paper will not
deposit at the bottom.

The quinones produced,
causing the weight loss rate of the positive plate grid alloy to exceed 200%.
Accelerate the corrosion of the positive plate, resulting in
reduced battery life and capacity.

Disadvantages of Glass Fiber Mat Pasting Paper



Normal absorption of sulfuric acid

Because of inside **binders,**
During acid injection,
the high temperature causes the binders to soften and penetrate into the AGM separator,
blocking it and preventing ions from passing through.
Leads to a **decrease** in battery capacity.

Adhesive blocks the separator
Does not absorb acid

Disadvantages of 100% Glass Fiber pasting paper

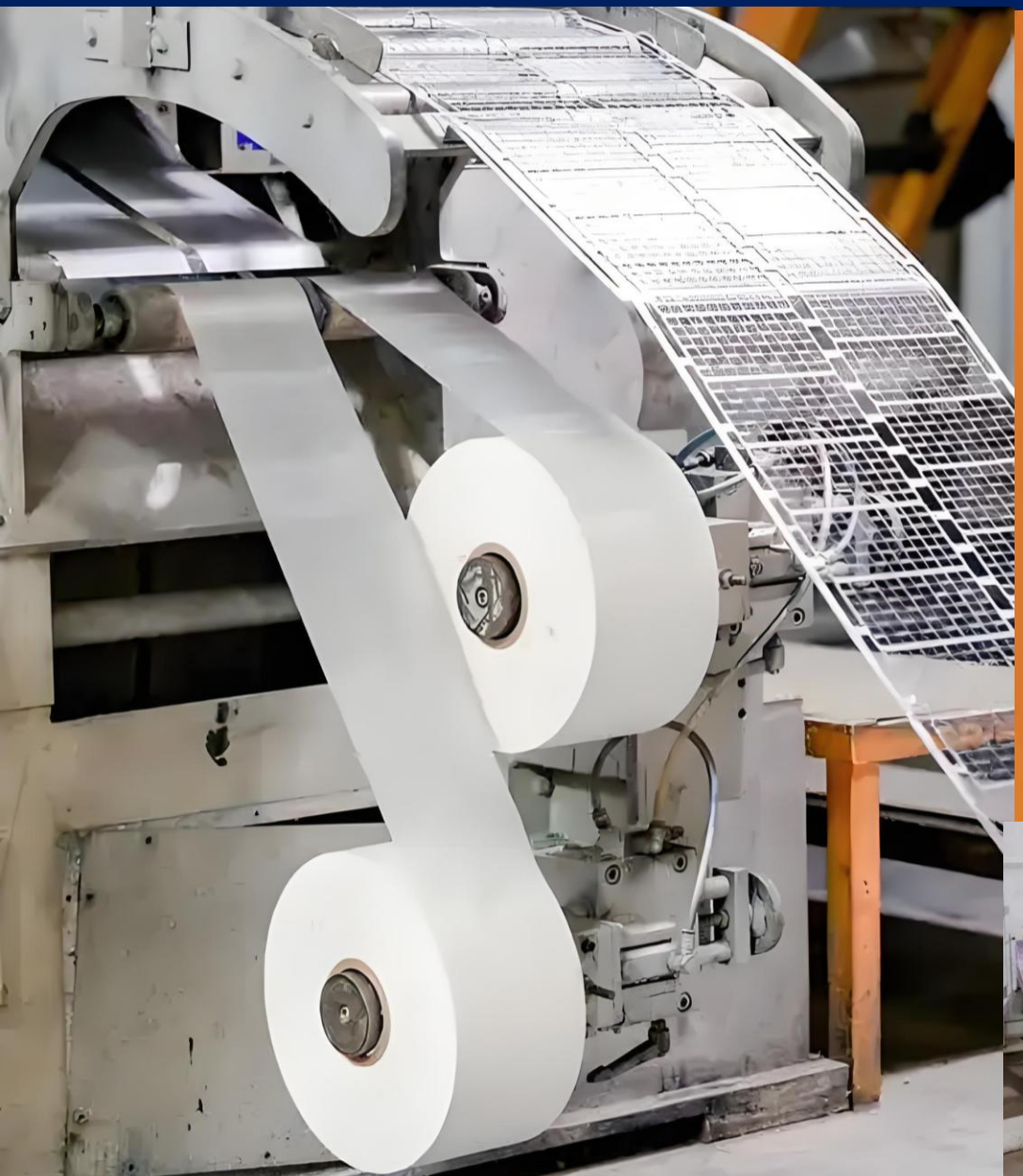
Low tensile strength,
making it prone to breaking during the pasting process.

Advantages of Mixed Glass Fiber Pasting Paper

- Not included inorganic or organic binders
- High tensile strength,
- Suitable for high-speed pasting
- The temperature of the drying kiln can be reduced to 50-80 ℃

For battery manufacturers,
they could save equipment investment,
reduce related operating costs.

Issues Faced by Battery Manufactures



Mesh punching and continuous pasting equipment are being applied widely.
Wood pulp pasting paper dissolution & corrosion

- **Wet assembly pressure decrease**
- **Positive Plate Mudding**
- **Grid corrosion**

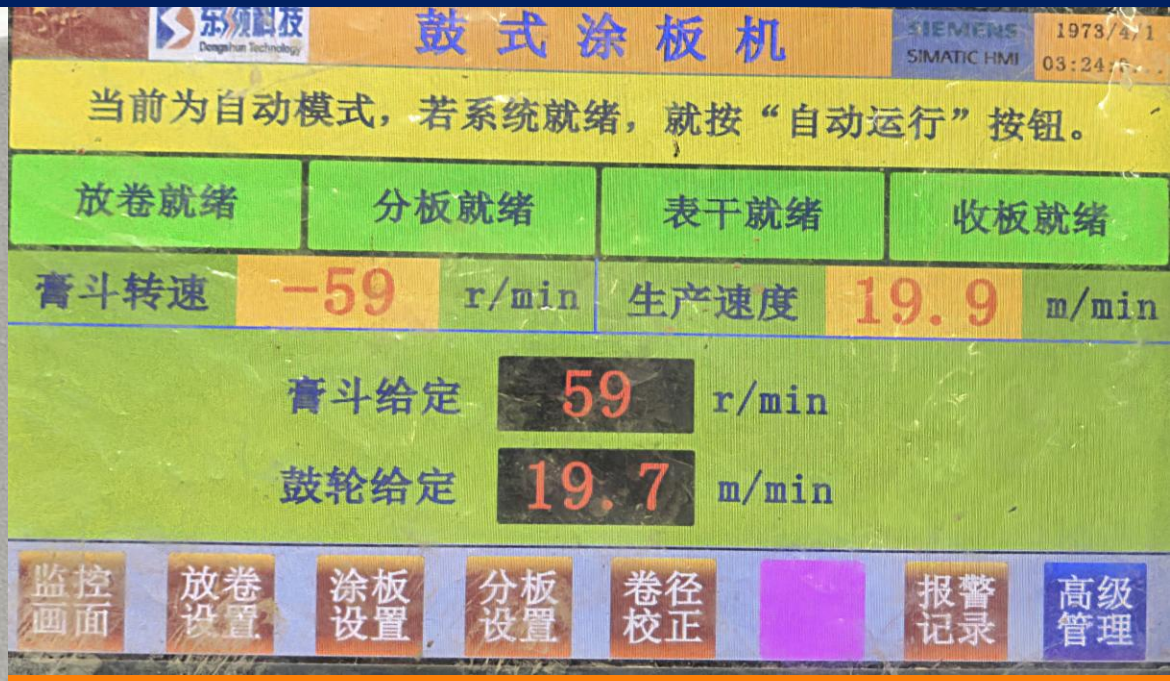
Reduce battery life
To address the issues, Hua Yang and Chilwee Group jointly developed Mixed Glass Fiber pasting paper for continuous pasting of positive plates.

Performance Comparison

Wood Pulp Pasting Paper VS. Hua Yang Mixed Glass Fiber Pasting Paper

Parameter	Wood pulp pasting paper	Hua Yang Mixed AGM pasting paper
Tensile strength (MPa)	15–20	30–40
Acid resistance weight loss rate (72h, %)	8–12	≤1
Internal resistance (mΩ)	12–15	6–8
High-temperature life (60℃, number of cycles)	150–200	≥600
Low-temperature capacity (-20℃, %)	78	82
Thickness accuracy (μm)	±20%	±8%
Thermal stability (°C)	80	≥300
Gas evolution (mL/Ah)	0.25	0.20

Improvement in Tensile Strength Increased from ≥0.1kN/m to ≥0.15kN/m



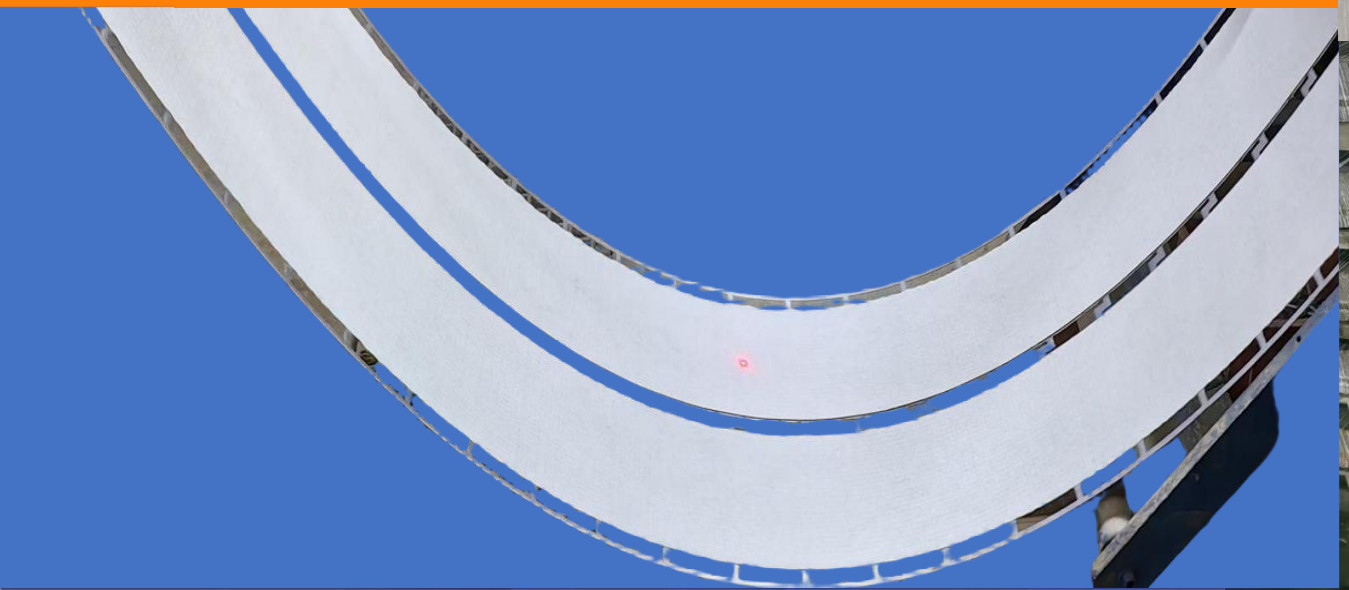
Tensile strength ≥ 0.80N/mm², suitable for high-speed pasting, with a maximum pasting speed of up to 22m/min.

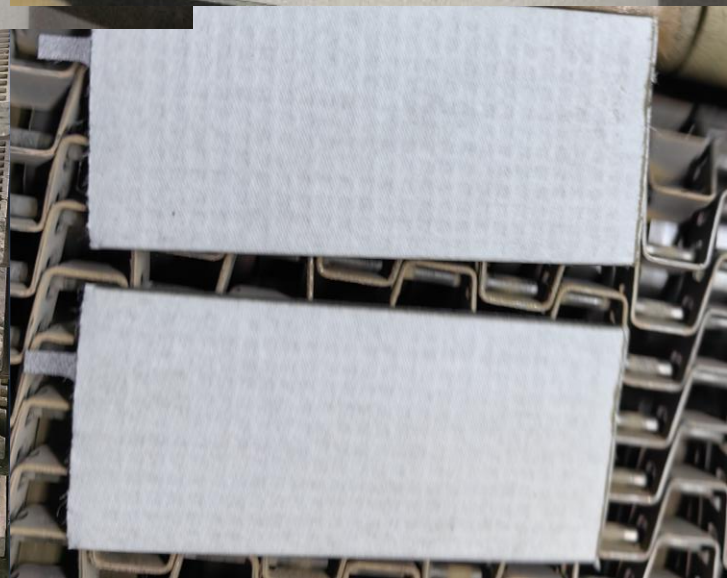
The Video of Pasting Positive Plate by Mixed Glass Fiber Pasting Paper

- The slitting knife is very clean, with no lead paste leaking out and adhering.
- The flatness of the plate improves.

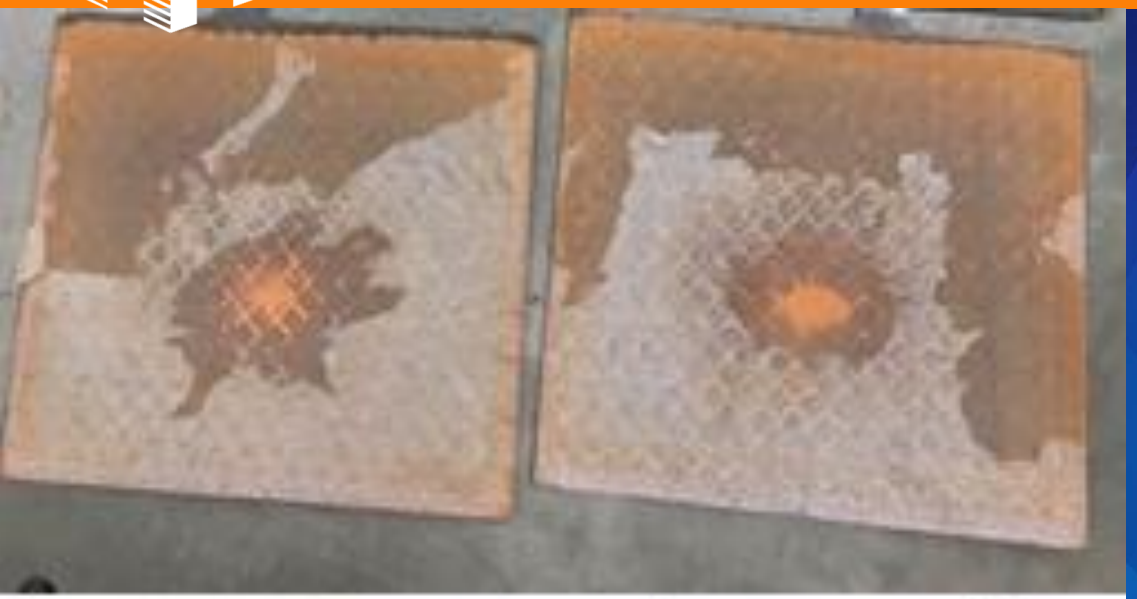
The Effect After Pasting by Mixed Glass Fiber Pasting Paper

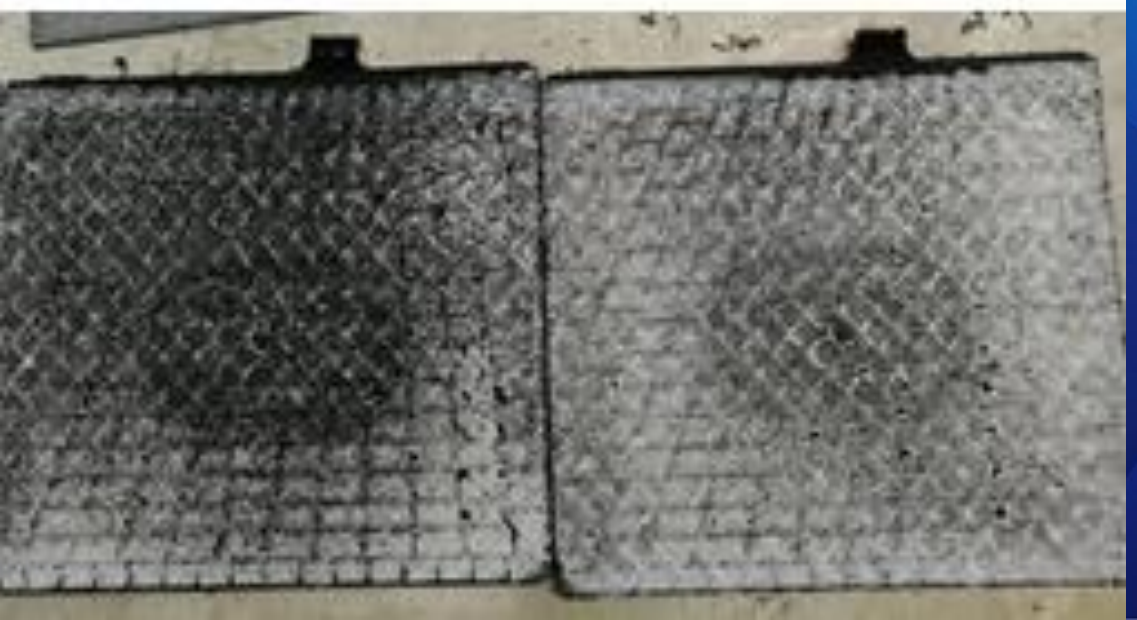
The surface is clean and tidy
No lead paste overflow.





The Comparison of Positive Plate Surface Before VS After Pasting Wood Pulp Pasting Paper

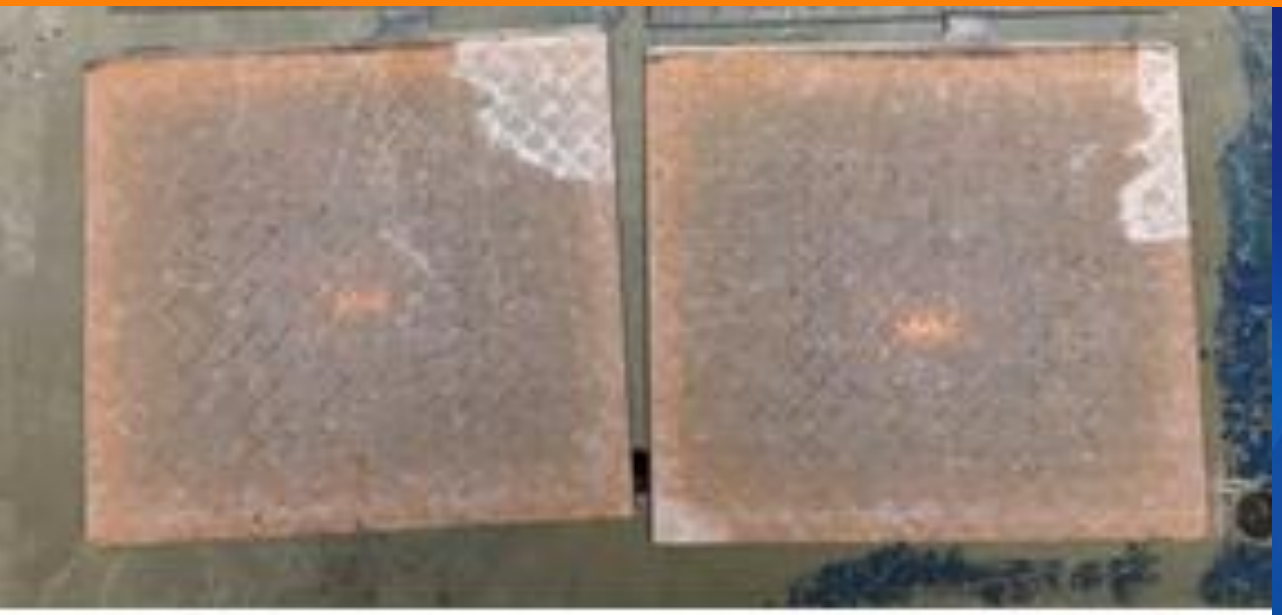


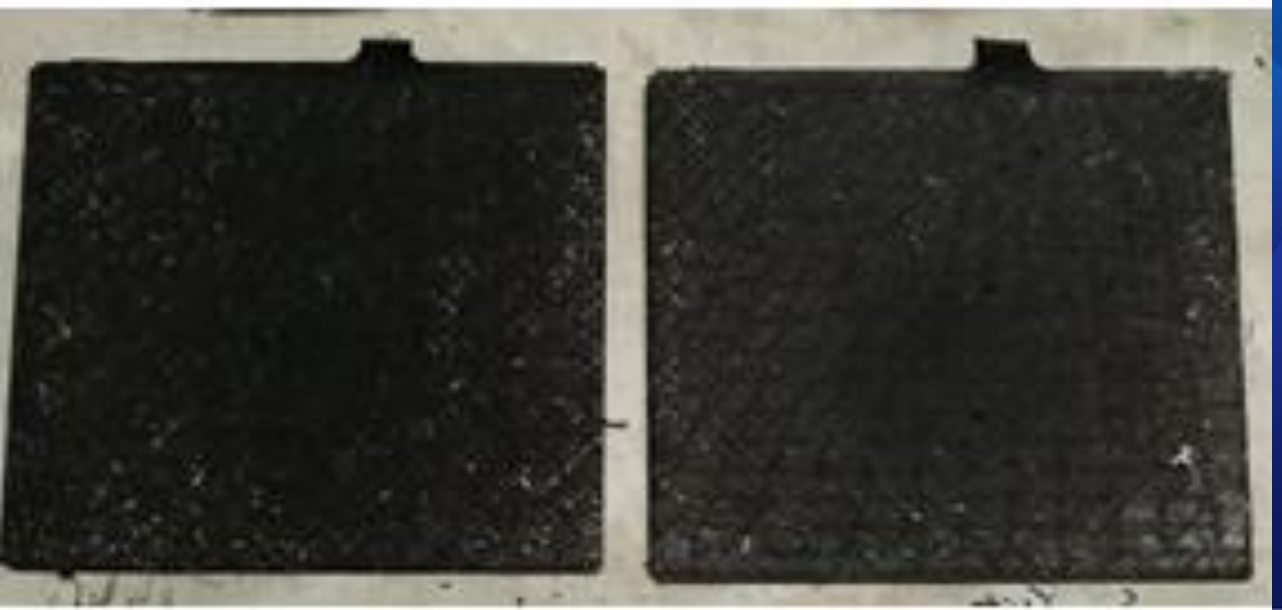


Before formation:
The dry point of the lead paste in the central area is large,
making it difficult for acid to penetrate.

After formation:
There are white residues on the surface after the paper dissolves.
A significant color difference in the central area, and the acid is difficult to penetrate.

The Comparison of Positive Plate Surface Before VS After Pasting Mixed Glass Fiber Pasting Paper

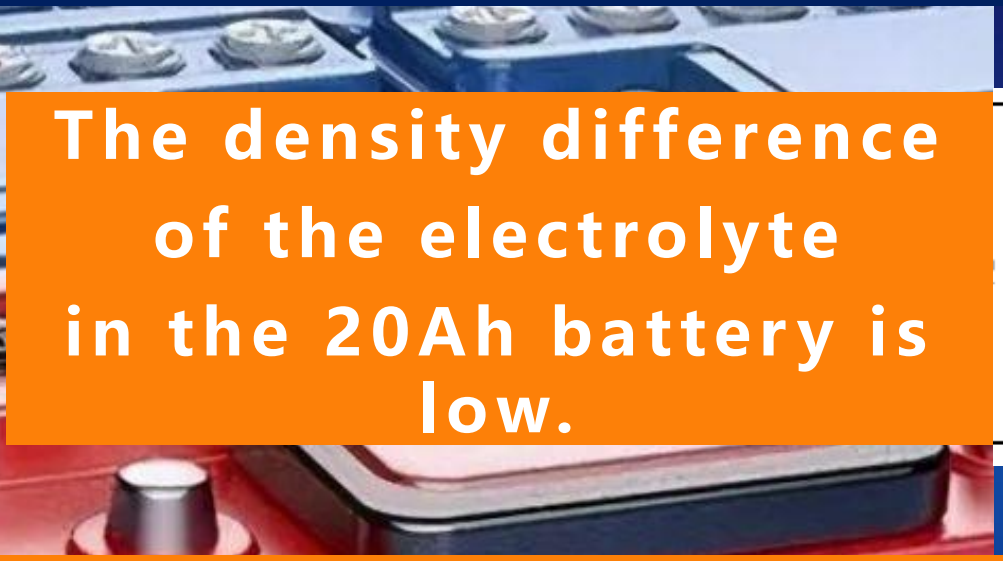




Before formation:
The dry point of the paste in the central area is small, making it easier for acid to penetrate.

After formation:
No white residue
No obvious color difference in the central area, and the acid penetrates easily.

Test Results of Batteries Assembled with Hua Yang Mixed Glass Fiber Pasting Paper



The density difference of the electrolyte in the 20Ah battery is low.

20AH冲网新品试验 解剖隔板酸密度（g/cm³）					
单格顺序	上	中	下	均值	差值
1-3	1.3662	1.3663	1.3687	1.3671	0.0025
3-3	1.3513	1.3555	1.3564	1.3544	0.0051

The terminal voltage and open-circuit voltage of the 20Ah battery are stable.

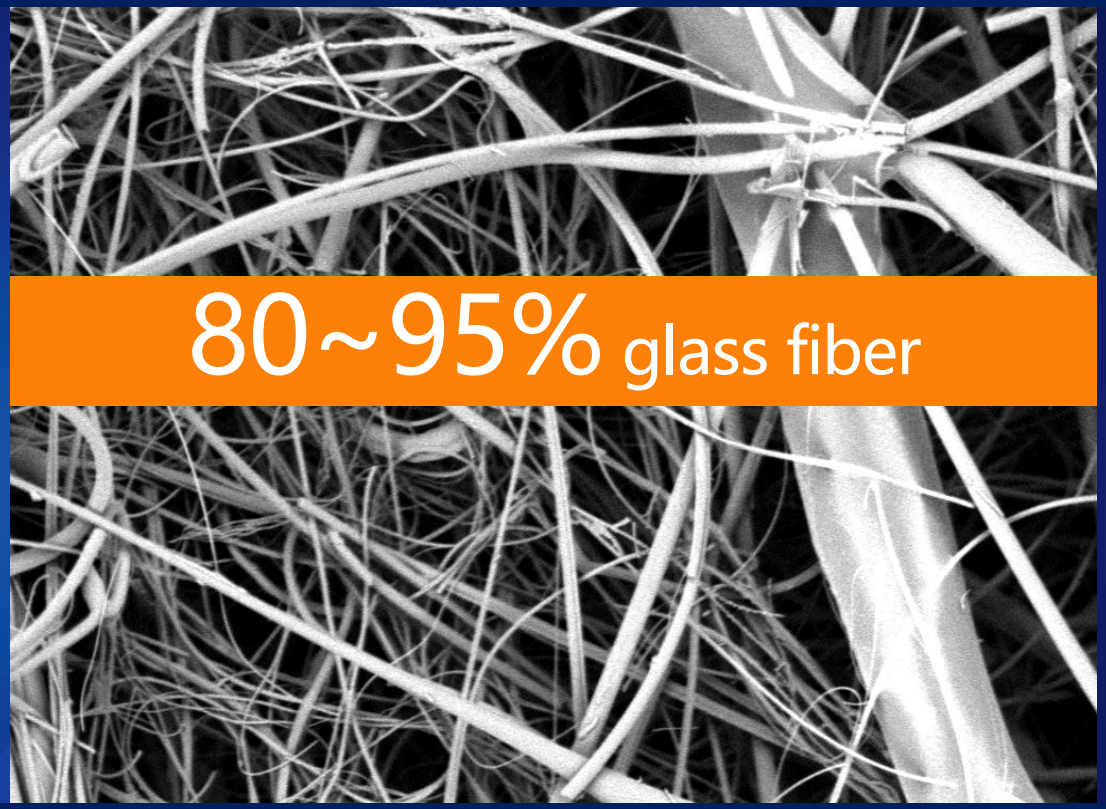
序号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	平均值
终止	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
终止补	10.821	10.843	10.861	10.879	10.764	10.689	10.669	10.363	10.976	10.946	10.962	10.775	10.668	10.146	10.968	10.918	10.910	10.832	10.930	10.879	10.790
开路	13.420	13.424	13.441	13.410	13.416	13.418	13.436	13.443	13.414	13.423	13.408	13.423	13.420	13.432	13.424	13.418	13.447	13.419	13.418	13.445	13.425

3

What we’ve done for Hua Yang Mixed Glass Fiber Pasting Paper?

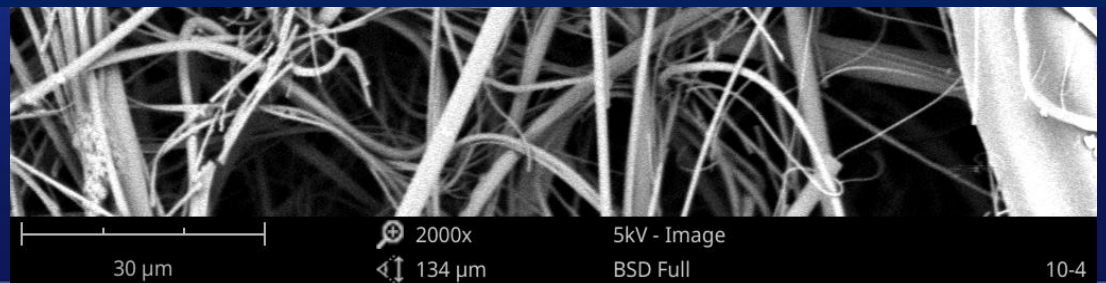
Raw Materials of Mixed **Glass Fiber P**asting Paper

5~20%CoPET-PET Fiber



80~95% glass fiber

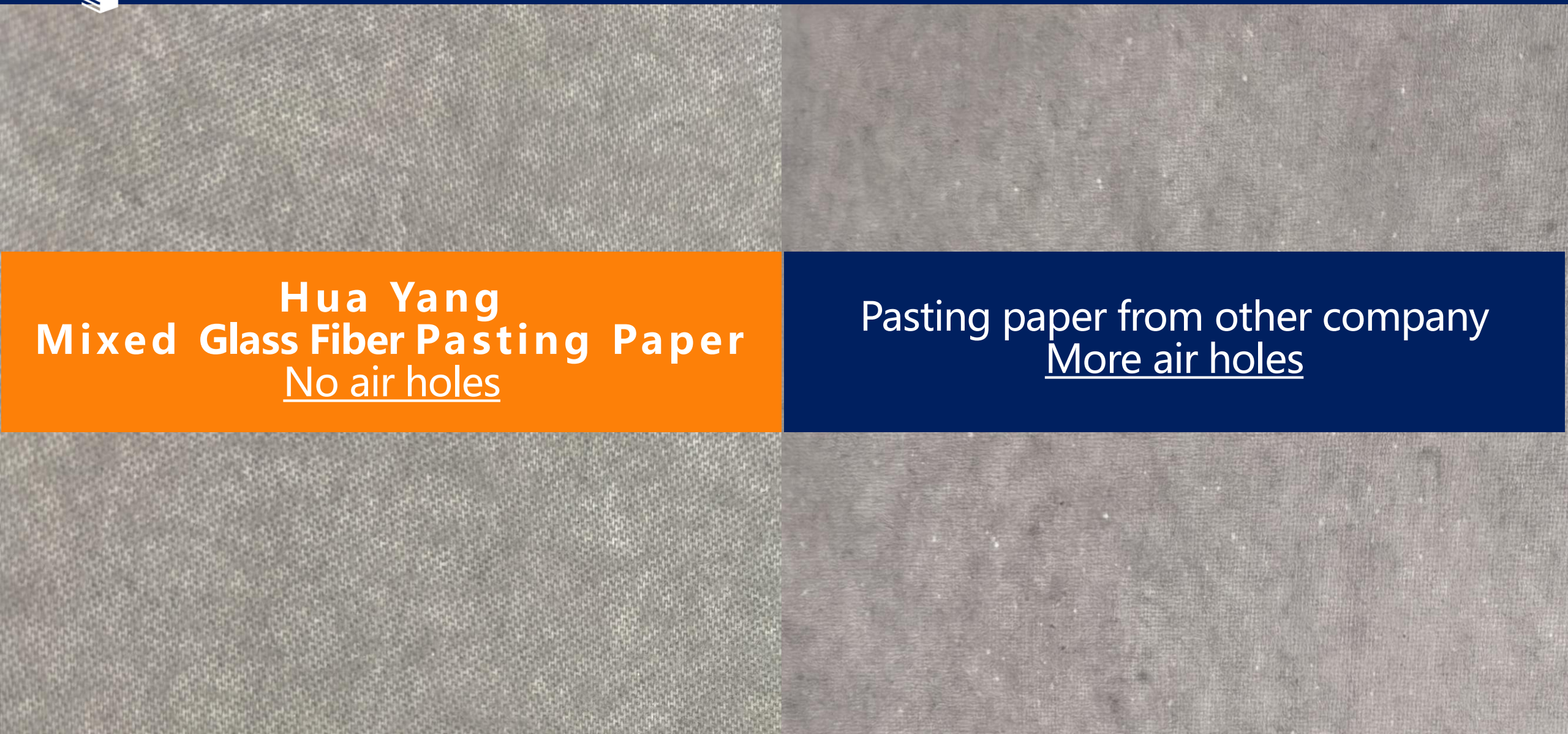
Does’ t contain any organic or inorganic binders.



Pulping Tech of Mixed **Glass Fiber P**asting Paper

"HY uses a new type of pulp distribution system to reduce bubbles in the pulp, ensuring uniform fiber distribution & no air holes, which can preliminarily prevent dendritic short circuits in batteries."

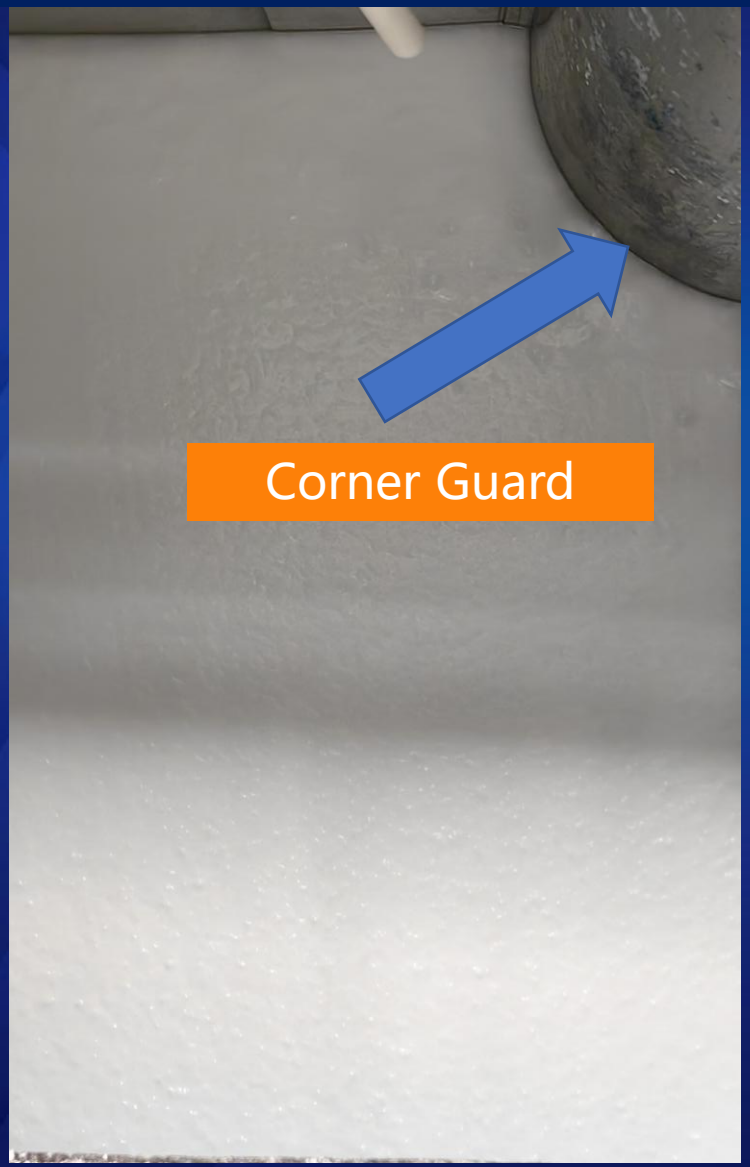
Pulping Tech of Mixed **Glass Fiber P**asting Paper



Hua Yang
Mixed Glass Fiber Pasting Paper
No air holes

Pasting paper from other company
More air holes

Pulping Tech of Mixed **Glass Fiber P**asting Paper

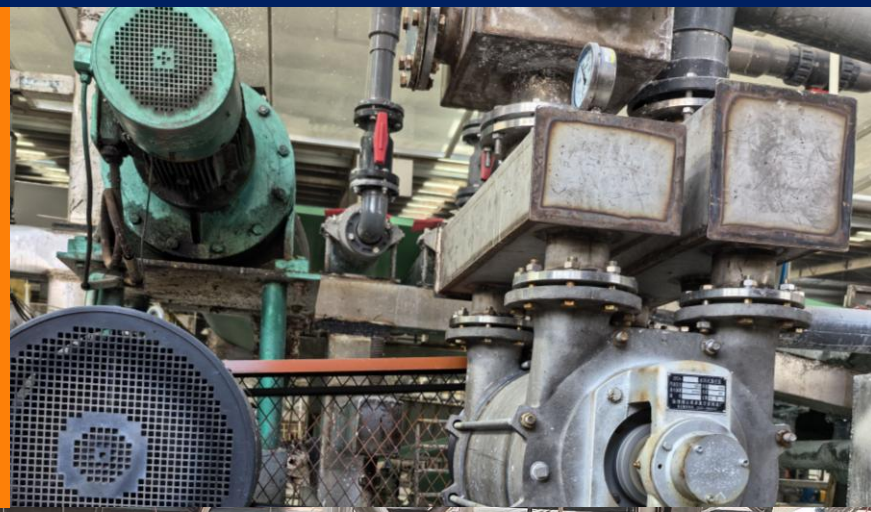


Transform the vertical mixer into a lateral push machine to ensure uniform of pulping mixing.

The pulping tank is equipped with corner guards to prevent pulping splashing and the formation of fiber lumps.

Forming Tech of Mixed **Glass Fiber P**asting Paper

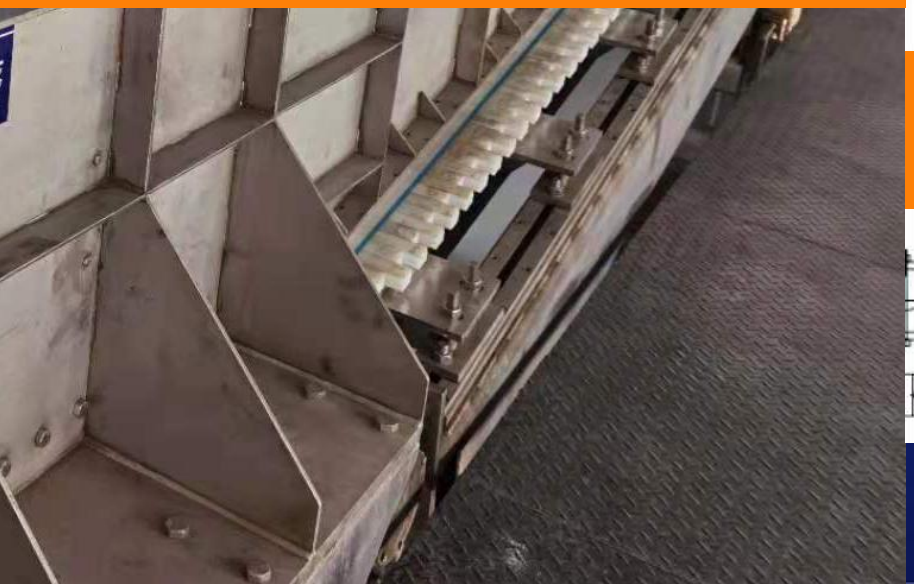
- Extend dehydration area
- Reduce the concentration of the pulping on the forming net
- Make the distribution of glass fiber more uniform.

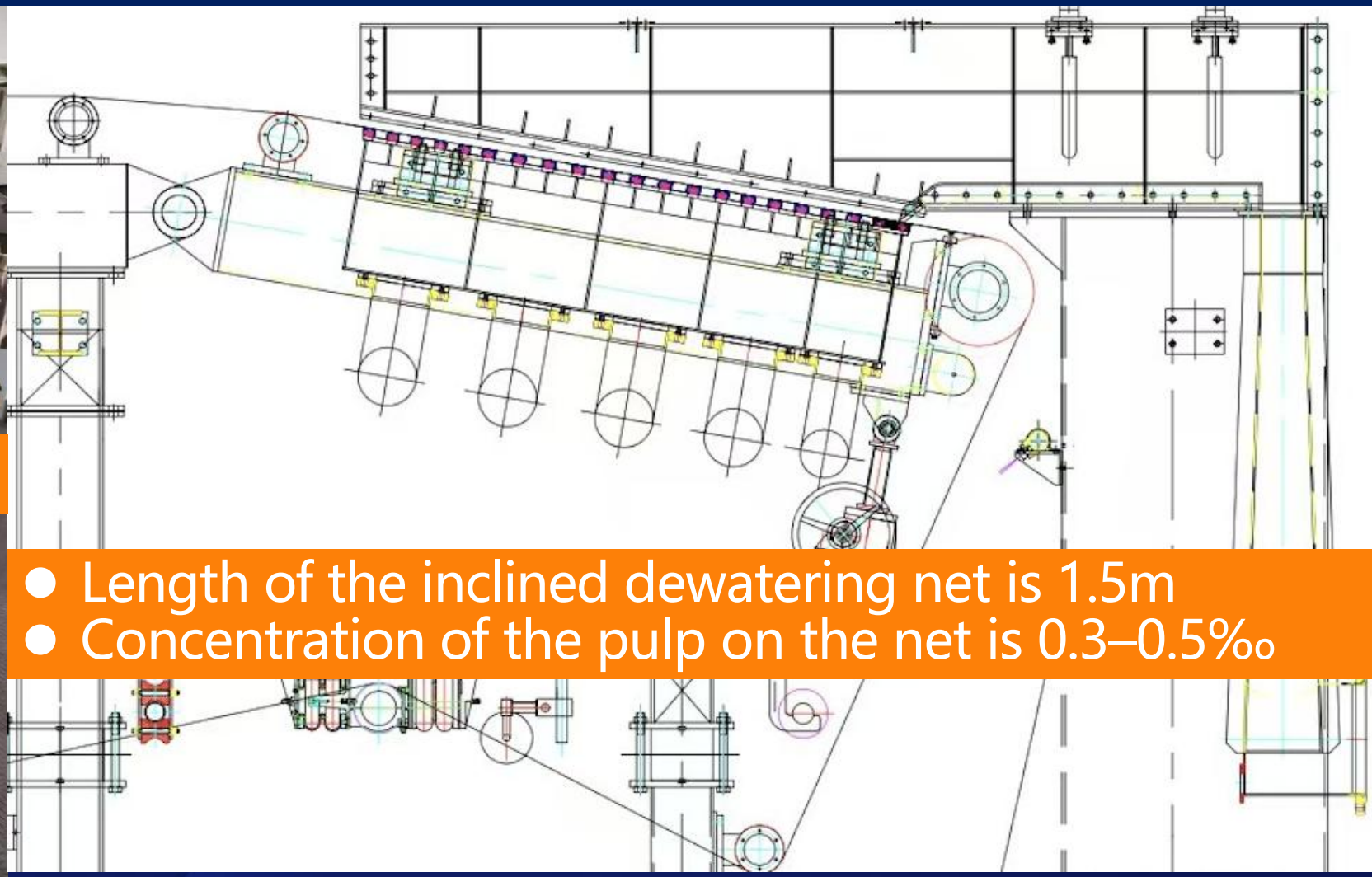


- Increase the vacuum degree
- Reduce the moisture content of wet separator

Forming Tech of Mixed **Glass Fiber P**asting Paper

Forming angle is 8~15°





- Length of the inclined dewatering net is 1.5m
- Concentration of the pulp on the net is 0.3–0.5‰

Drying Tech of Mixed **Glass Fiber P**asting Paper

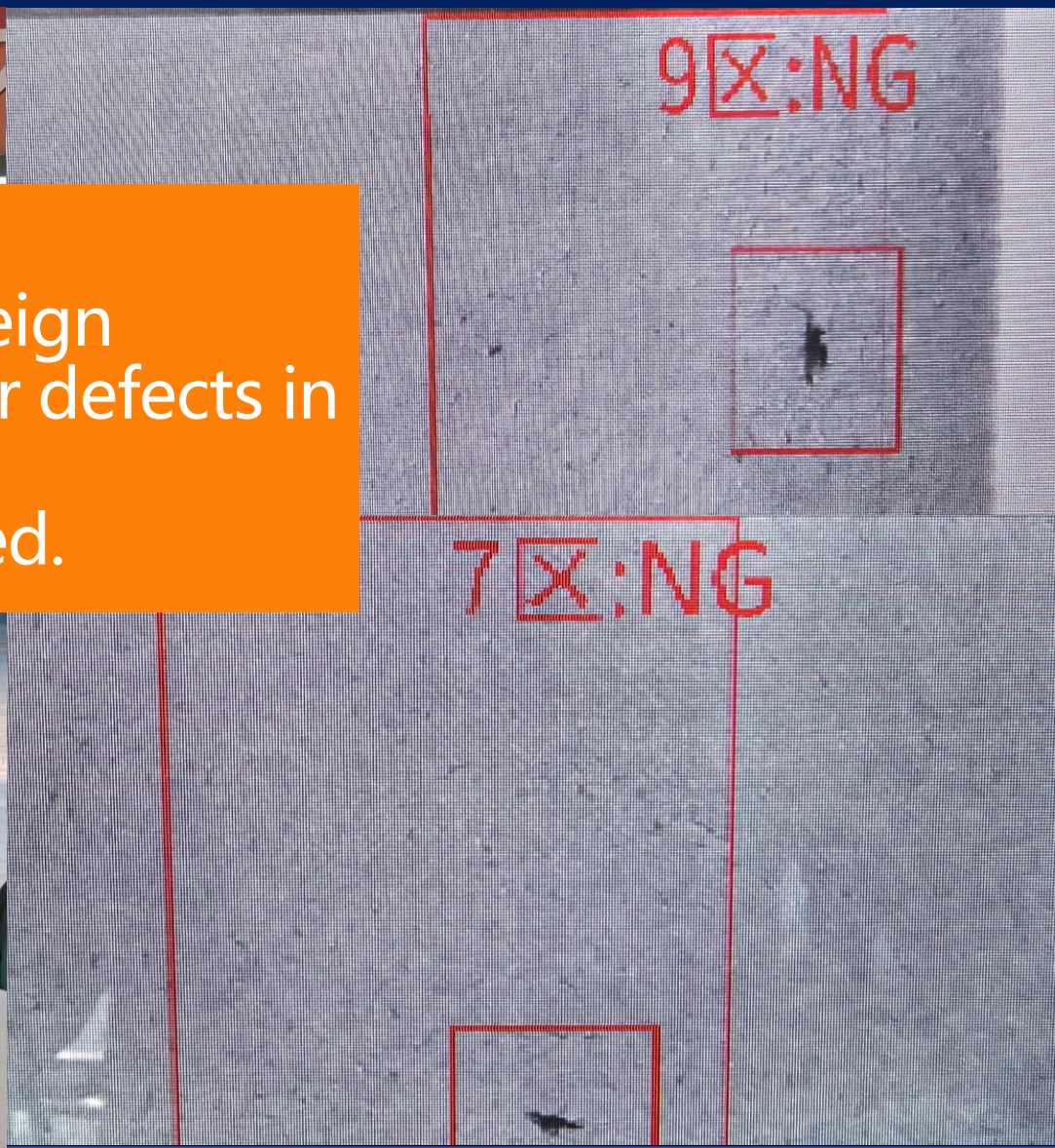
Adjust air volume, direction & guide roller

Greatly improve flatness of surface

Rolling Tech of Mixed **Glass Fiber P**asting Paper

Visual inspection system

- By shining strong light on the product, foreign objects, fiber lumps, perforations and other defects in the product can be identified.
- An alarm and area marking can be triggered.



4 Development Status of Sodium-Ion Batteries in China

2025

For Sodium-Ion Battery

It’s a year from
lab technology to large-scale commercial application.

For China’s New Energy Industry

It’s a year from to achieve the transformation from a
"battery manufacturing powerhouse"
to an
"energy technology leader."

The main technical indicators of sodium batteries in China

Technical Indicator	2025 Level (Examples)	Reference (LFP Battery)
Energy Density	175 Wh/kg (CATL 2nd Gen)	150-210 Wh/kg
Low-Temp Performance (-40°C)	>90% capacity retention	Requires heating assistance
Safety	Passes shooting, nail penetration, crush tests; no explosion	Prone to thermal runaway at high temps
Cycle Life	Up to 7000+ cycles; Energy storage batteries >20000 cycles	3000-6000 cycles
Fast Charging Capability	15 mins to 80% (room temperature)	30-40 mins to 80% SOC

China's sodium-ion battery industry Production Capacity Layout

01

Sodium-salt battery production line has achieved mass production in Ordos

- The world's first 720V high-voltage sodium-salt battery production line.
- Makeing China as the third country to master this technology and achieve commercialization.
- The total investment is up to 3.5 billion yuan, with annual output value striving for 6 billion yuan.

02

CATL and HiNa Battery promoted the industrialization of sodium-

- CATL launched its "Xiaoyao" sodium-ion battery brand and plans to mass-produce a 24V start-stop integrated battery for heavy-duty trucks and high-voltage power batteries in 2025.

03

Expansion Industrial synergistic effect

- With the release of production capacity, advantages in cost control and market promotion are much bigger.
- The production capacity of sodium-ion batteries in China is expected to reach 60 GWh in 2025.

China's Sodium-ion Battery Industry Application Scenarios

01

Energy Storage Market

- The most promising application fields
- Particularly in grid energy storage, commercial & industrial energy storage, residential energy storage, and communication base station backup power.
- Effectively achieve "peak shaving and valley filling."

02

Low-Speed Electric Vehicles

- The cost and safety advantages are particularly prominent in this field.
- Including electric two-wheelers, tricycles, and low-speed four-wheelers.

03

New Energy Vehicles

- Lynk & Co 900 will be equipped with CATL's Xiaoyao super hybrid battery.
- CATL plans to use its high-voltage power sodium batteries in PHEVs and BEVs, aiming for ranges exceeding 200km and 500km respectively.

China's sodium-ion battery industry Challenges

Cost Control	• Still needs to be decreased through large-scale production and improved industrial chain maturity.
Technol-ogical Maturity	• The long-term cycle stability, consistency, and energy density of sodium battery material systems still need improvement.
Market Accepta-nce	• Need more successful commercial cases and long-term practical application verification to gain widespread trust from end-users.
Standar-ds and Supply	• The lack of unified performance testing standards affects the comparability of products. Unstable supply of high-quality biomass precursors has an adverse impact on the longterm development.

China's Sodium-Ion Battery Industry Opportunities

Autonomous control of resources

- Sodium resources are abundant and widely distributed
- Great significance for ensuring China's energy security.

Government Policy and Industry Support

- Provided high attention and support
- Providing strong momentum for technological breakthroughs and industrial application.

Application scenario expansion

- More fields such as large-scale electrochemical energy storage, electric ships, and smart energy systems.
- Global demand for sodium-ion batteries is expected to reach 116 GWh by 2026

5

Breakthrough Research on Glass Fiber Separators for Sodium-ion Batteries

Characteristics of Glass Fiber Separators

Exceptional High-Temperature Resistance

- Withstand temperatures up to 700°C
- Effectively preventing large-scale short circuits and buying valuable time for safety.

Excellent Flame Retardancy and Explosion Prevention

- Fundamentally eliminating the risk of separator combustion

Suitable Puncture Resistance

- Disordered fiber structure provides some mechanical restraint against dendrite growth.

Good Electrolyte Wettability

- Outstanding performance of absorption and retention of electrolytes, helping to reduce internal battery resistance.

Comparison with Traditional Separators

Property	Glass Fiber Separators	Traditional Polyolefin Separators
Heat Resistance	Extremely high (up to 700°C)	Poor (begins thermal shrinkage around 100°C)
Flame Retardancy	Excellent (non-combustible)	Poor (flammable)
Thickness	Natural thickness 100-120μm, ≤50μm after compression	Can be made thinner (e.g., around 10μm)
Cost	Currently relatively high	Low (advantages of mass production)
Mechanical Strength	Requires improvement (relatively brittle)	Good (meets requirements for battery winding and stacking processes)
Main Advantages	**High safety**, high-temperature resistance, flame retardancy	**Low cost**, mature technology, good mechanical properties, easy thinning

Application Status of Glass Fiber Separators in **Sodium-ion Batteries**

01

Enhancing Battery **Safety**

- Improve the thermal stability
- Especially in energy storage systems & electric vehicles.

02

Lab Research & High Performance Demonstrations

- Excellent electrochemical stability
- Fully leverage **Sodium-ion** potential performance

03

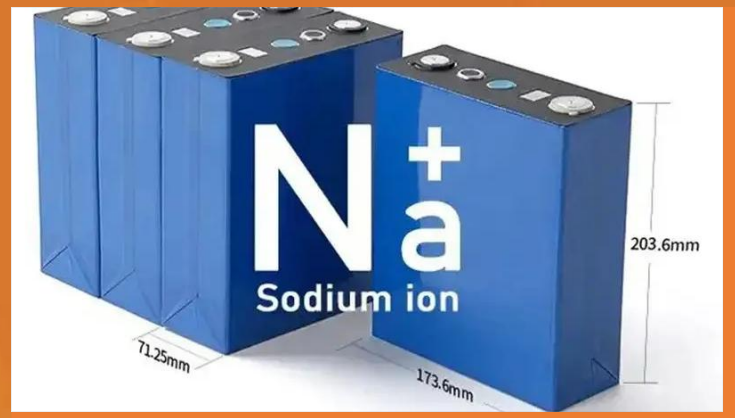
Addressing Special Application Scenarios

- Extreme safety requirements
- Higher operating temperatures

Challenges of Glass Fiber Separators in **Sodium-ion Batteries**

☐ Cost Issues

- Complex production process make the cost higher



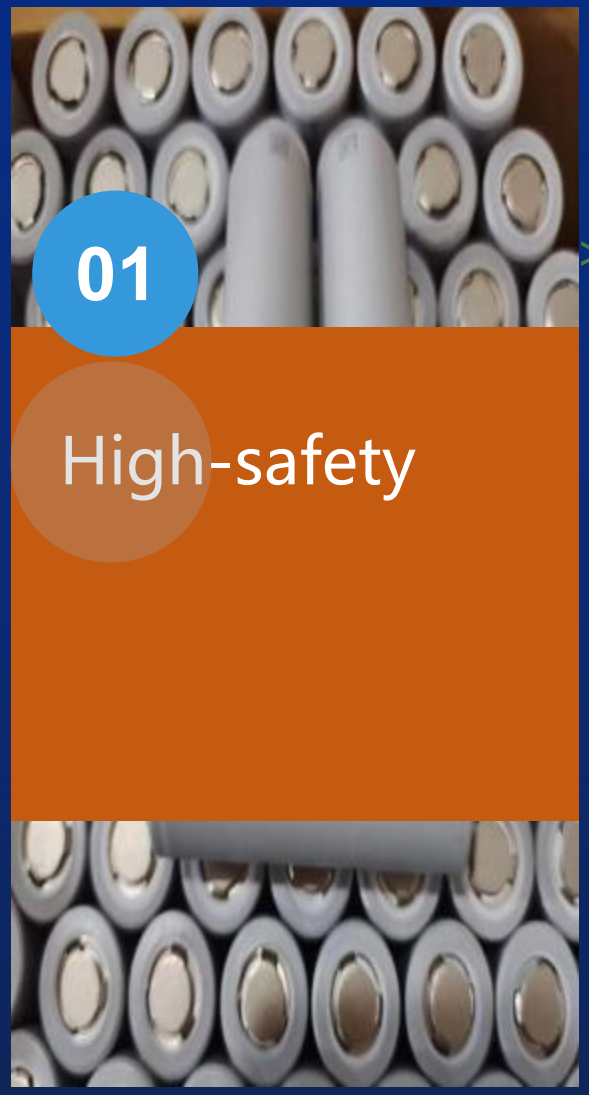
☐ Balancing Thickness & Energy Density

- Reducing thickness while maintaining uniformity and mechanical strength remains technically challenging

☐ Process Compatibility

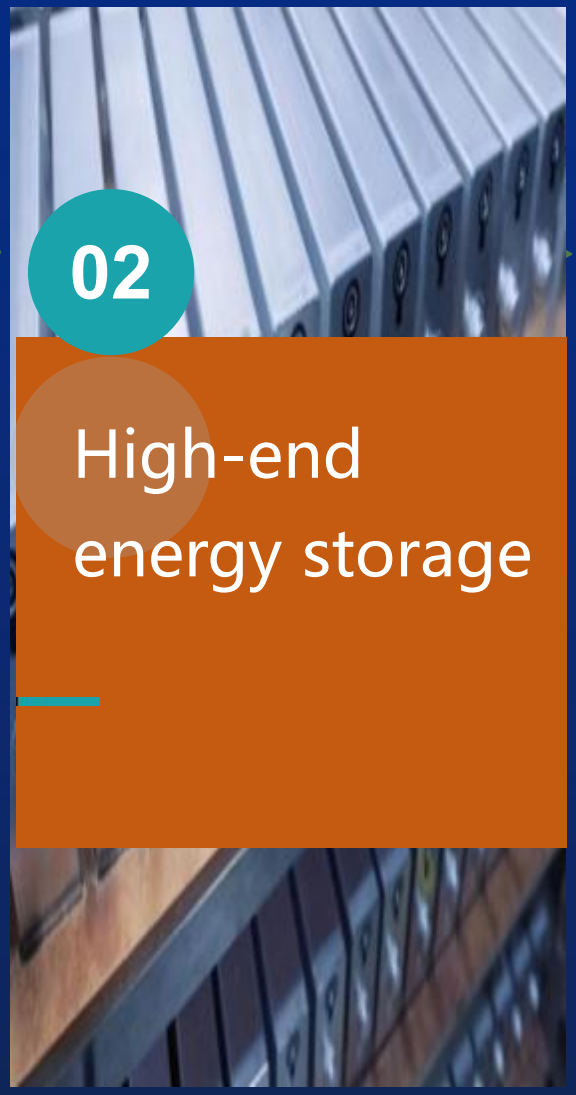
- The brittleness of AGM require battery manufacturers to adjust and optimize existing electrode assembly processes

Hua Yang AGM for Sodium-Ion Battery Focuse on



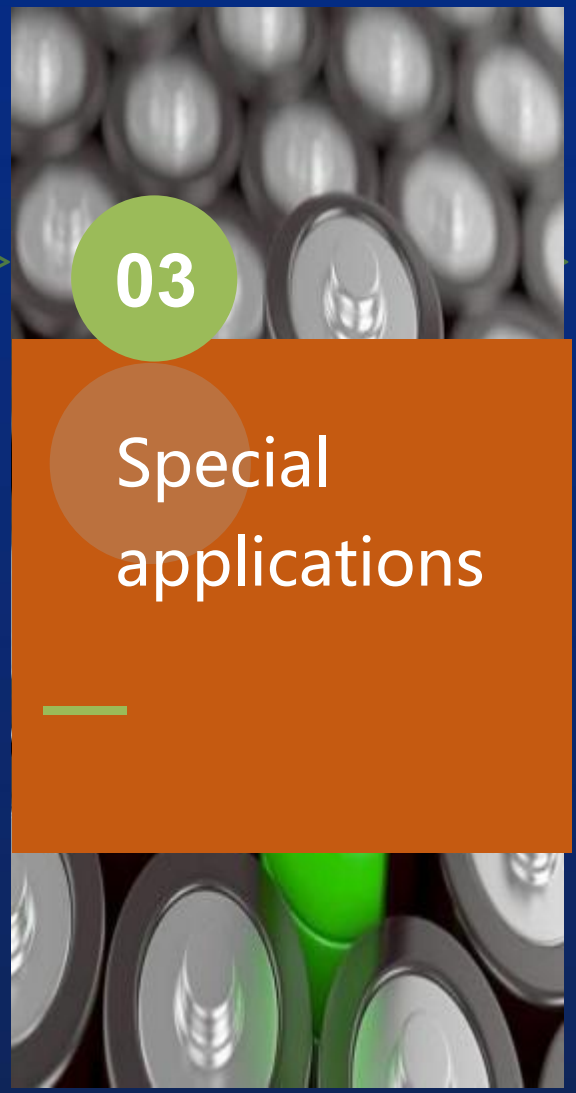
01

High-safety



02

High-end energy storage

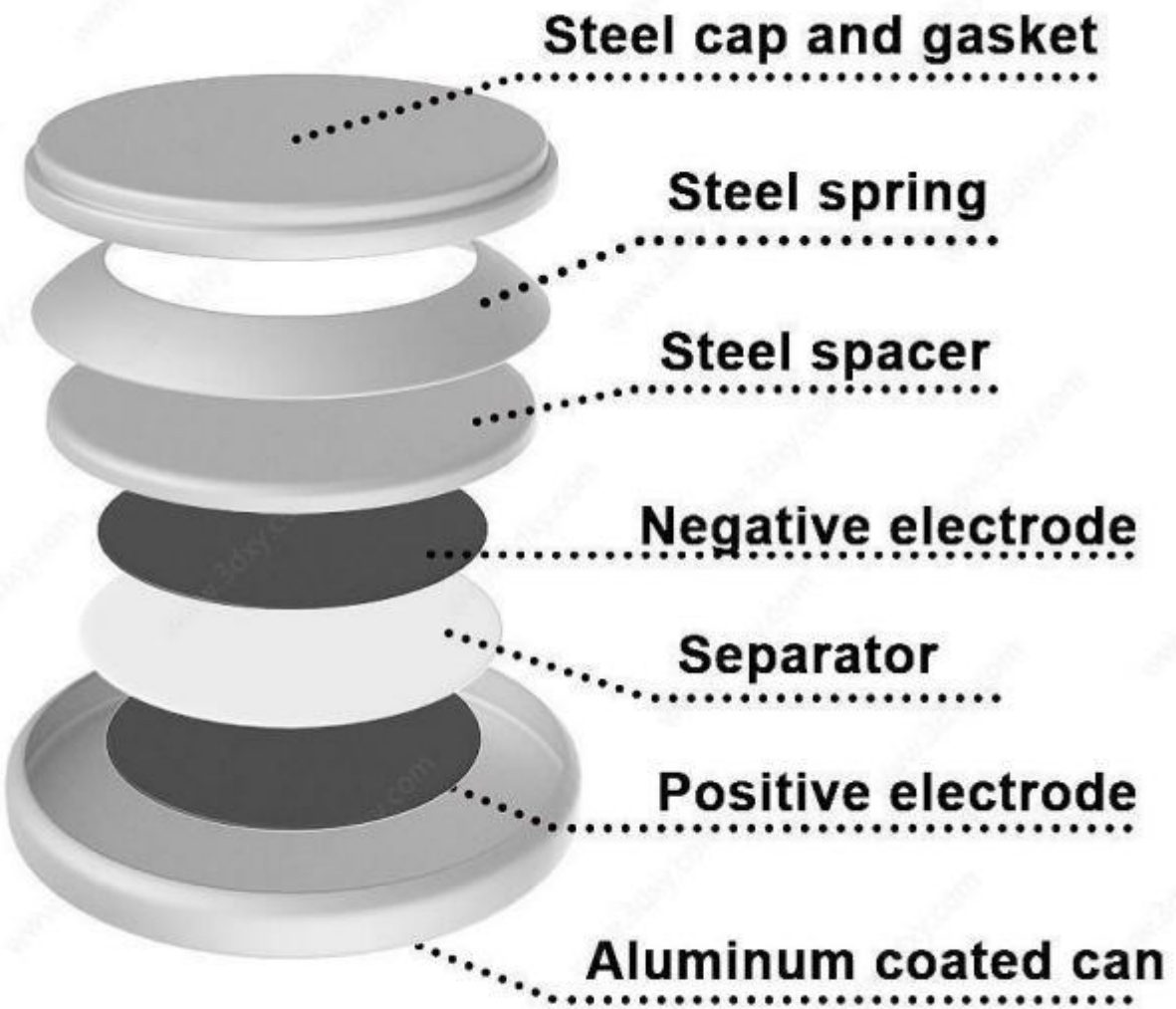


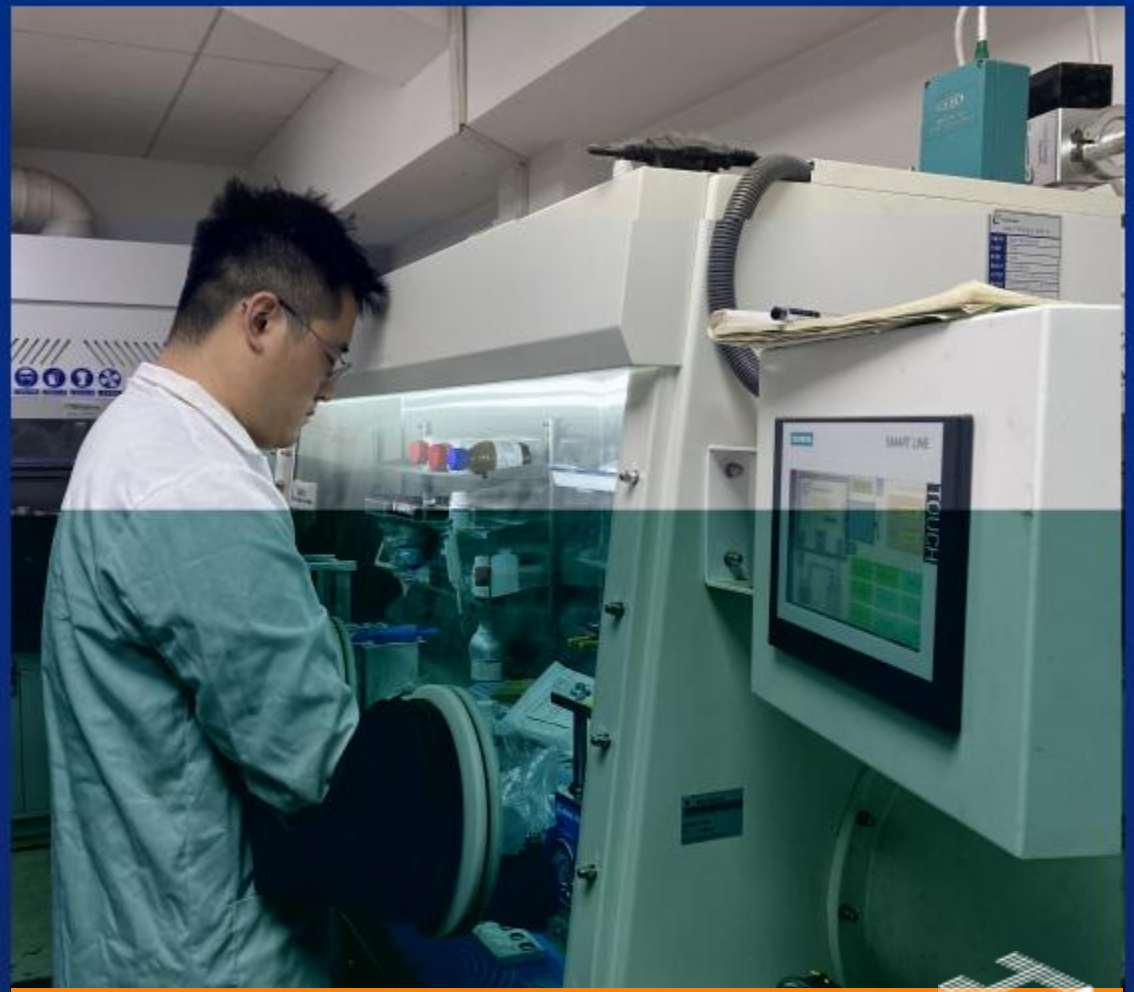
03

Special applications

04

In-depth R&D and application



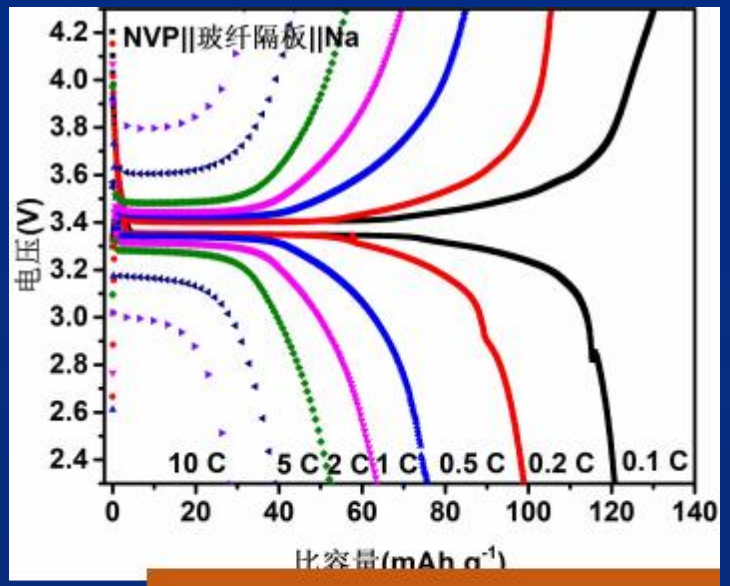


王朝阳 PHD
Zhaoyang Wang
Engineer of R&D

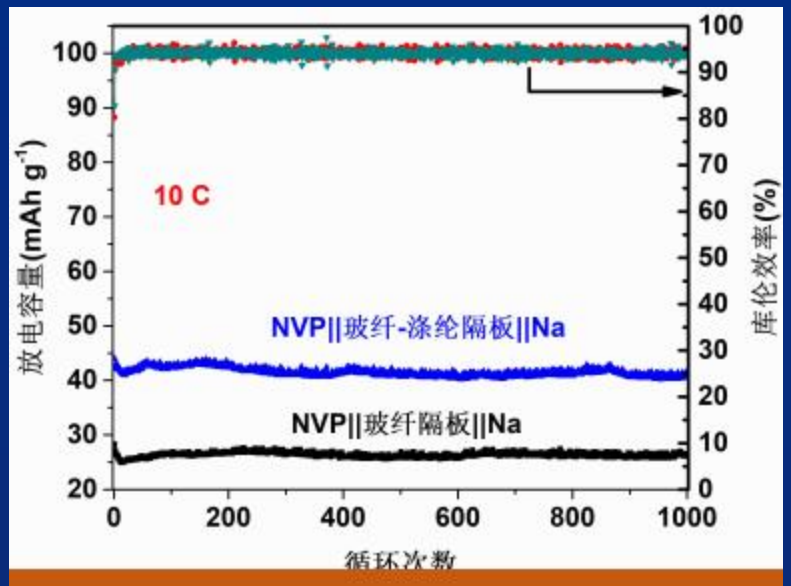
HUA
YANG
INDUSTRY

Sodium-Ion Button Battery Assembly Process

Performance comparison of sodium batteries assembled by different types of AGM



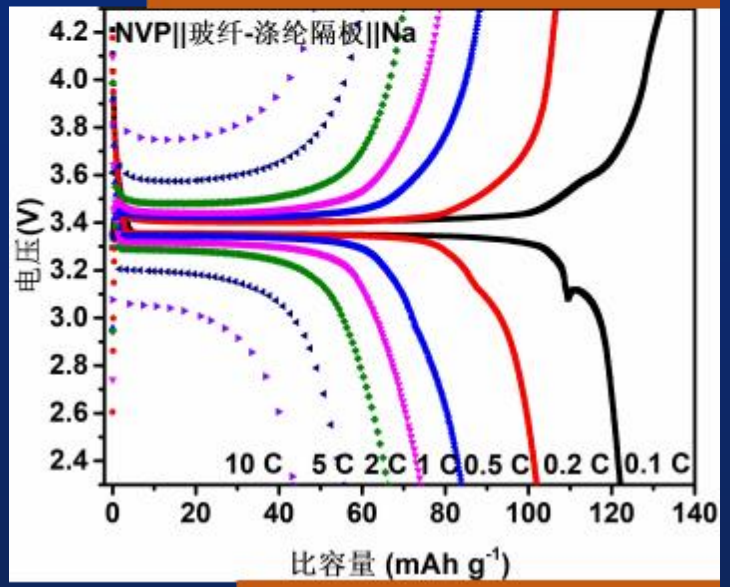
Pure glass fiber AGM



100C Cycle performance comparison

Yes, AGM could assembled into sodium battery.

The test showed electrochemical performance after multiple rates of current charging and discharging,



AGM with PE fiber

But,

the capacity attenuation faster, under the condition of high rate charge and discharge capacity may not ideal.

We are considering further optimizing the glass formulation...

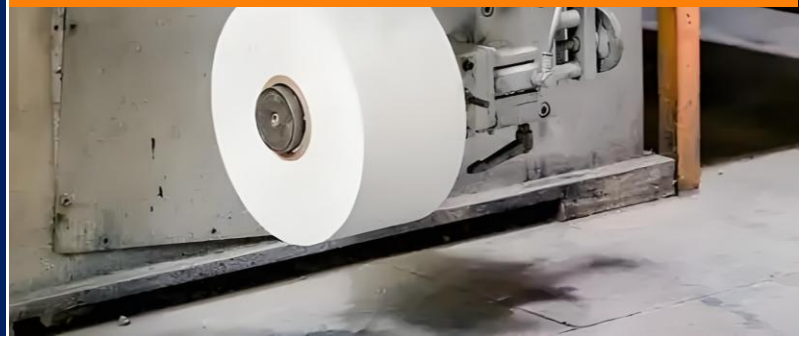
HUA YANG INDUSTRY

To balance safety, mechanical properties, and cost.

We are trying to...

1

Coating polyolefin separators with glass fiber layers or developing multilayer composite structures



2

Continuous optimization of production processes on flame method for glass fibers & wet process forming for AGM.


Innovation For Future

The idea is important
But action is the soul.

Innovation with Passion & love For Future.

“I am extremely honored to have the opportunity to witness the transformation of China's new energy industry from a "battery manufacturing powerhouse" to a "leader in energy technology".

This energy storage revolution is reshaping the global energy landscape with Chinese solutions..”

---Sophia Du

Go further

Together

Hua Yang Booth No.60

Thanks For Your Attention