

**BTR**<sup>®</sup>

Better our world

中国宝安集团旗下企业



# BETTER OUR WORLD

创新引领 聚力卓越  
绿色和谐 合作共赢

BUY BETTER, BUY BTR

创新引领新能源产业进步  
构建美好绿色世界

- ✔ 全球领先的锂离子电池正负极材料供应商
- ✔ 全球率先拥有负极材料完整价值产业链的企业
- ✔ 《锂离子电池石墨类负极材料》国家标准制定者
- ✔ 创建全球业内首家新能源技术研究院
- ✔ 主导及参与制定19项国际/国家标准
- ✔ 已获授权专利286项



贝特瑞新材料集团股份有限公司（835185.OC）成立于2000年，是中国宝安集团旗下的控股企业，公司主营业务为锂离子电池材料及碳纳米材料，包括负极材料、正极材料、石墨烯材料三大业务板块，是集基础研究、产品开发、生产销售于一体的国家级高新技术企业，在新能源材料领域持续创新、不断超越，引领着锂离子电池材料行业发展方向。

贝特瑞产品远销海内外市场，覆盖全球十大锂电池厂商，是松下、三星、LG、SKI、村田、CATL、BYD等优秀国内外新能源企业的长期合作伙伴，连续多年在锂离子电池正负极材料市场占有率全球领先。

## 产业布局

## INDUSTRIAL LAYOUT

上下游全产业链布局,奠定了BTR不可替代竞争优势汇聚三大产业集群，共享全产业链布局优势，打造全球最具影响力产业平台





## 负极

- 新型碳负极
- 负极



矿山原料



产品解决方案



## 正极

- LFP
- NCA/NCM ( $\text{Ni} \geq 0.8$ )



智慧工厂



循环回收



## 石墨烯

- 防腐涂料
- 导热薄膜



研发、对外合作平台



应用平台





# NATURAL GRAPHITE

## 天然石墨

### 高容量、高压实复合石墨负极材料

Composite graphite of high capacity and high density

- ✓ 高容量 High capacity
- ✓ 高压实 High density
- ✓ 长寿命 Long cycle life

适用于圆柱、铝壳、软包等锂离子电池

Applicable to cylindrical, prismatic and pouch type lithium ion battery

型号 model	D50 μm	最大压实密度/Density g/cm <sup>3</sup>	容量/Capacity mAh/g	效率 / Efficiency %
MCG	13 ± 1.0	1.80	≥360.0	≥95
HRG	16 ± 1.0	1.80	≥360.0	≥95

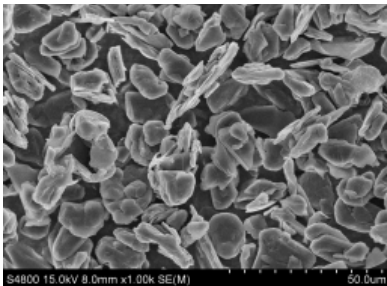


Fig.1 SEM image of MCG

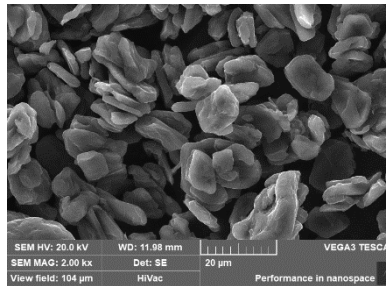


Fig.2 SEM image of HRG

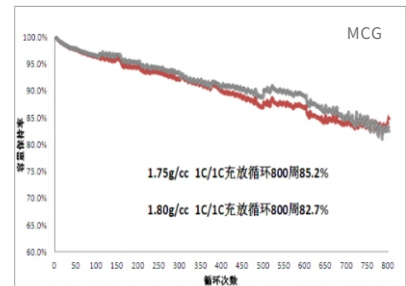


Fig.3 不同极片压实下的充放电循环性能 (RT, 1C/1C, LCO(3.0-4.35V))

# NATURAL GRAPHITE

## 天然石墨

### 低膨胀、长循环天然石墨负极材料—LSN系列、GSN系列

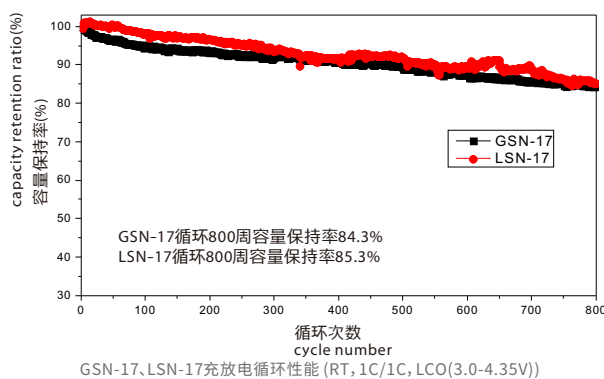
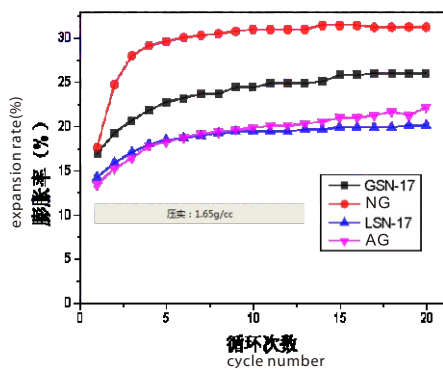
Natural graphite of low swelling and long cycle life—LSN series/GSN series

- ✓ 低膨胀                      Low swelling
- ✓ 长寿命                      Long cycle life

适用于聚合物，圆柱，铝壳等锂离子电池

Applicable to polymer, cylindrical, prismatic lithium ion battery

型号 model	D50 μm	首次容量 / Capacity mAh/g	首次效率 / Efficiency %
GSN-17	17.0±1.0	≥360.0	≥94.0
LSN-17	17.0±0.5	≥355.0	≥95.0



# NATURAL GRAPHITE

## 天然石墨

### 高功率、长寿命天然石墨负极材料——AGP系列

Natural graphite of high power and long cycle life for power lithium ion battery-AGP series

- ✓ 高功率 High power
- ✓ 长寿命 Long cycle life
- ✓ 低温性能良好 Good low temperature performance

适用于动力电池、电动工具、航模、电动自行车等

Applicable to power lithium ion battery for EV power tools , aeromodelling, E-bicycle, etc

型号 model	D50 μ m	首次容量 / Capacity mAh/g	首次效率 / Efficiency %
AGP8-8	9.0±1.0	≥360.0	≥93
AGP-7	7.0±1.0	≥358.0	≥90

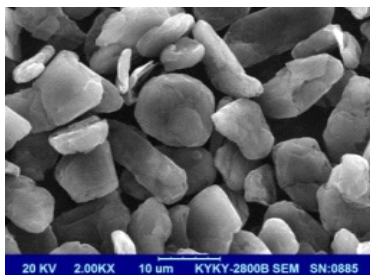


Fig.1 SEM of AGP8-8

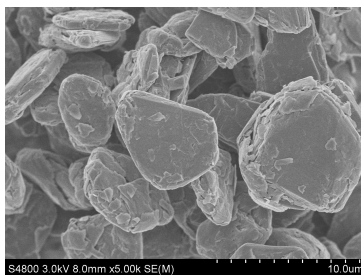


Fig.2 SEM of AGP-7

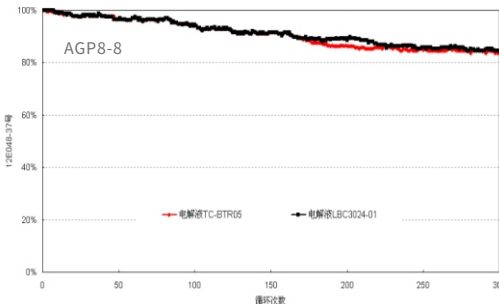


Fig.3 不同电解液下的充放电循环性能 (RT, 1C/1C, LCO(3.0-4.35V))



# SILICON-BASED ANODE MATERIALS 硅基负极材料

## 新型高容量Si基复合负极材料

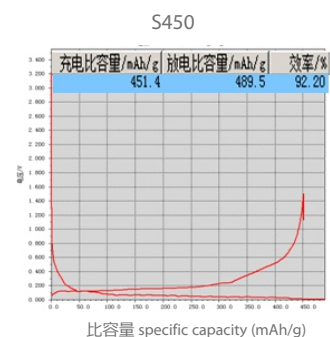
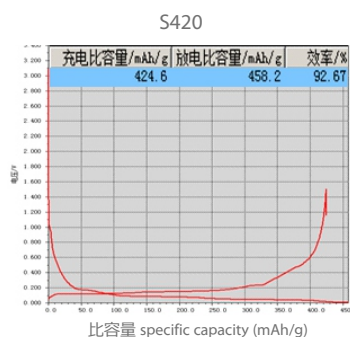
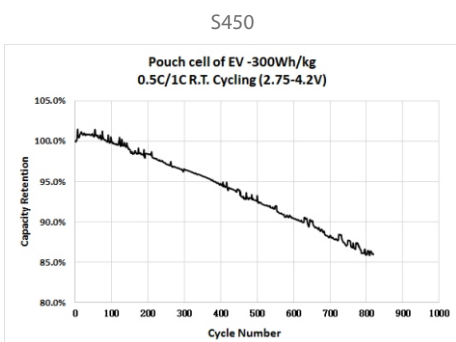
New type high capacity silicon-based composite anode materials

- ✓ 高容量                      High capacity
- ✓ 高倍率                      High rate
- ✓ 低膨胀                      Low swelling

适用于超高容量型的各种类型电池 (软包、铝壳、圆柱)

Applicable to ultra-high capacity of all type of battery (pouch, prismatic, cylindrical battery)

型号 model	D50 μm	比表面积 / SSA m <sup>2</sup> /g	压实密度 / Density g/cc	首次容量 / Capacity mAh/g	首次效率 / Efficiency %
S420	16.0±2.0	≤3.0	0.9±0.10	420±5	≥92.5
S450	16.0±2.0	≤3.0	0.9±0.10	450±5	≥92



FUTURE  
START

# ARTIFICIAL GRAPHITE

## 人造石墨

### 高性价比人造石墨负极材料——AGP系列

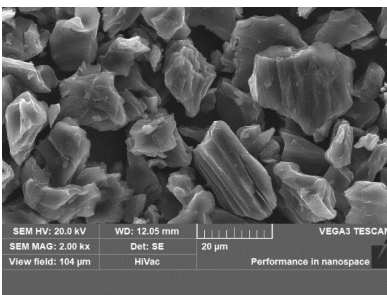
High cost-effective artificial graphite anode materials: AGP series

- ✓ 高性价比 Cost-Effective
- ✓ 长循环 (1C充放, 1000周 ≥90%) Long Cycle life

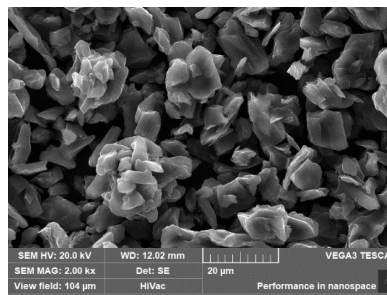
适用于ESS、xEV等电芯

Suitable for ESS, xEV and other batteries

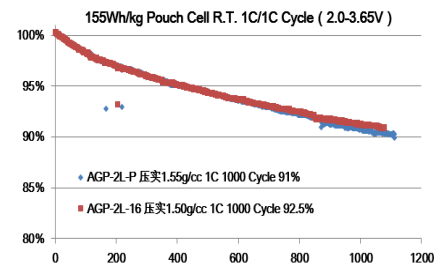
型号 model	D50 μm	振实密度 / Tap g/cm <sup>3</sup>	比表面积 / SSA m <sup>2</sup> /g	压实密度 / Density g / cm <sup>3</sup>	首次容量 / Capacity mAh/g	首次效率 / Efficiency %
AGP-2L-16	14-17	≥1.0	1.7±0.5	1.50-1.60	≥345	>94
AGP-2L-P	14-17	≥0.95	1.7±0.5	1.55-1.65	≥348	>94



AGP-2L-16

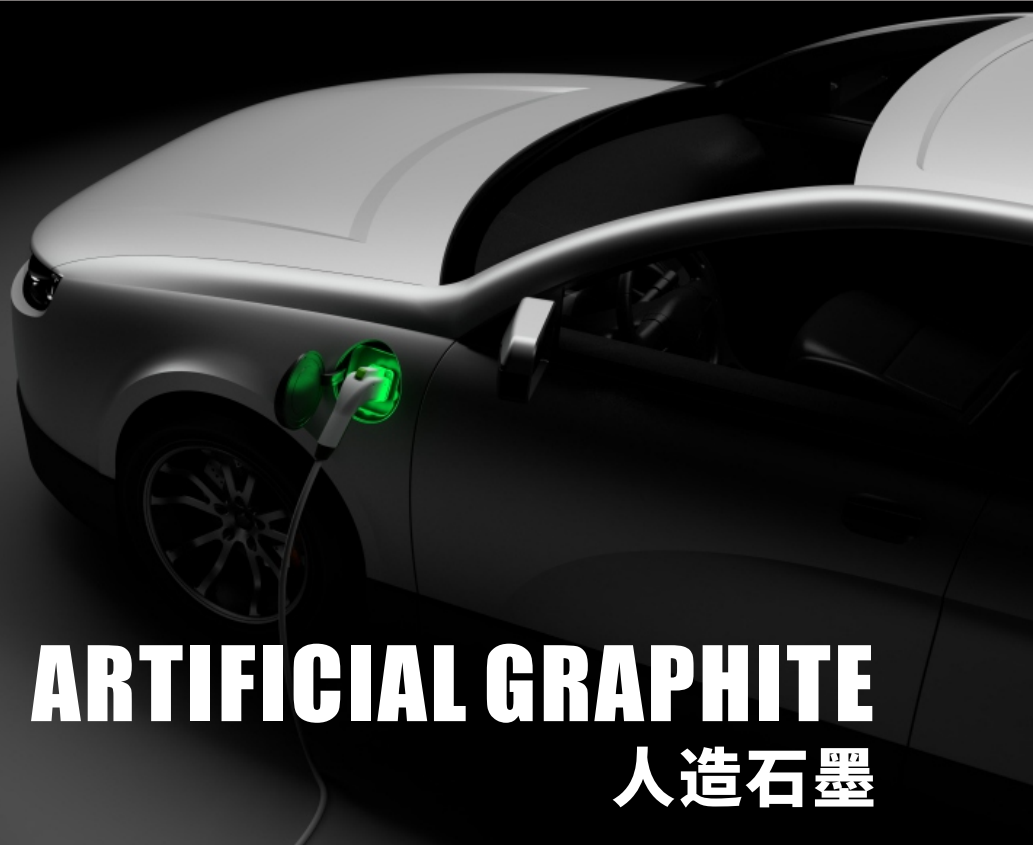


AGP-2L-P



AGP-6F 3C充放电循环  
charge-discharge cycle





# ARTIFICIAL GRAPHITE

## 人造石墨

### 快充人造石墨负极材料——BFC系列

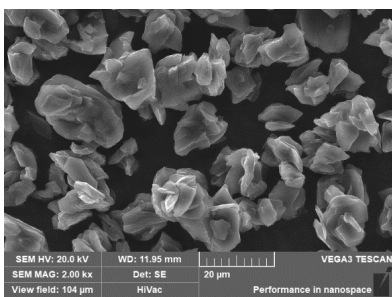
Fast charging artificial graphite anode materials: BFC series

- ✓ 高倍率      Fast charging ratio
- ✓ 高性价比      Cost-Effective
- ✓ 长循环      Long Cycle life

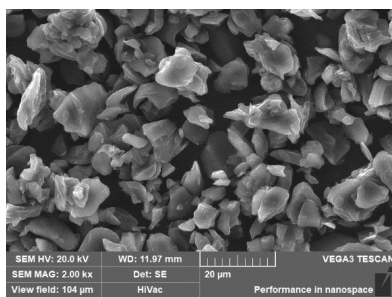
适用于xEV等电芯

Suitable for batteries such as xEV

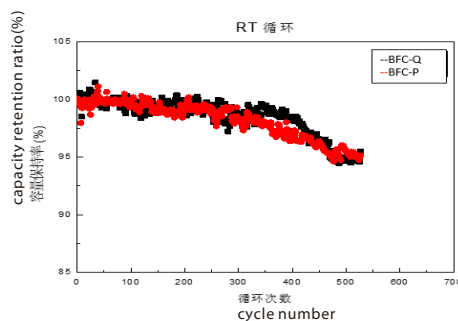
型号 model	D50 μm	振实密度 / Tap g/cm <sup>3</sup>	比表面积 / SSA m <sup>2</sup> /g	压实密度 / Density g / cm <sup>3</sup>	首次容量 / Capacity mAh/g	首次效率 / Efficiency %
BFC-Q	12-15	≥0.95	0.8-1.8	1.55-1.65	≥350.0	≥94.0
BFC-P	10-13	≥0.95	1.5-2.5	1.55-1.65	≥348.0	≥94.0



BFC-Q



BFC-P



# ARTIFICIAL GRAPHITE

## 人造石墨

### 高能量密度人造石墨负极材料——A系列

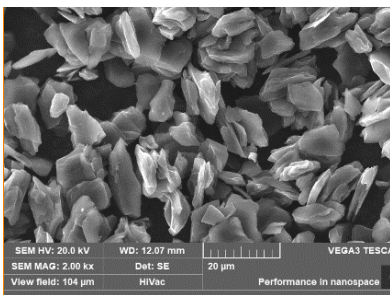
High energy density artificial graphite anode materials:A series

- ✓ 高能量密度 High energy density
- ✓ 低膨胀 Low swelling
- ✓ 长循环 Long Cycle life

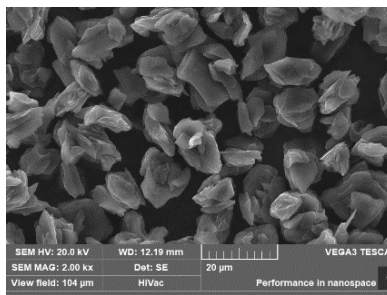
适用于:3C、xEV等电芯

Suitable for: 3C, xEV and other batteries

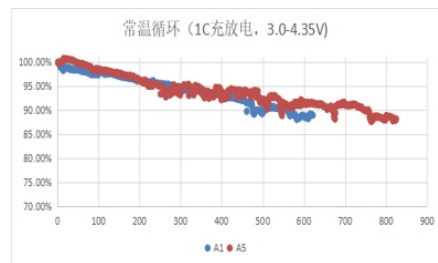
型号 model	D50 μm	振实密度 / Tap g/cm <sup>3</sup>	比表面积 / SSA m <sup>2</sup> /g	极片压实/Density g / cm <sup>3</sup>	首次容量 / Capacity mAh/g	首次效率 / Efficiency %
A5	13-16	≥0.95	1.0-2.0	1.75-1.85	≥357.0	≥94.0
A1	14-17	≥0.85	1.0-2.0	1.70-1.80	≥355.0	≥94.0



A5



A1



# NEW ANODE MATERIAL

## 新型负极材料

### 快充软/硬炭负极材料:BSC400、BHC-450

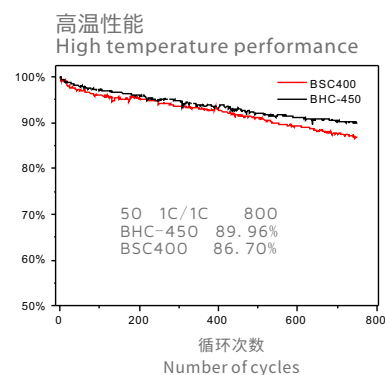
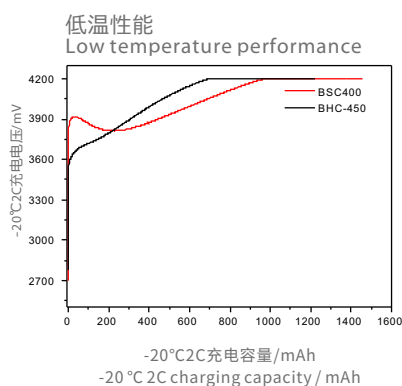
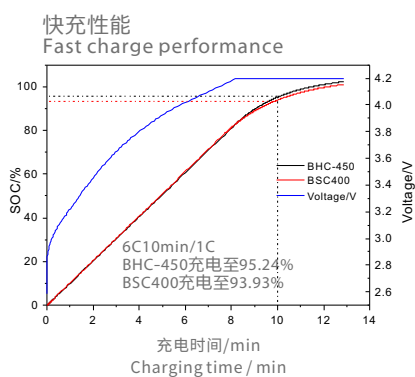
Fast charging anode materials soft carbon and hard carbon: BSC400, BHC-450

- ✓ 高容量 High capacity
- ✓ 高/低温优异 Excellent high/low temperature performance
- ✓ 快充 Fast charging

适用于功率型、低温型、低膨胀型锂离子电池

Applicable to power, low temperature and low swelling lithium ion batteries

型号 model	D50 μm	振实密度 / Tap g/cm <sup>3</sup>	比表面积 / SSA m <sup>2</sup> /g	极片压实 / Density g / cm <sup>3</sup>	首次容量 / Capacity mAh/g	首次效率 / Efficiency %
BHC-450	8.0-12.0	0.75±1.0	≤5.0	1.0±0.05	≥450	≥83
BSC400	8.0-9.5	0.9±1.0	≤3.0	1.2±0.05	≥400	≥84.5





## 磷酸铁锂正极材料——T 系列

Lithium iron phosphate cathode materials-T Series

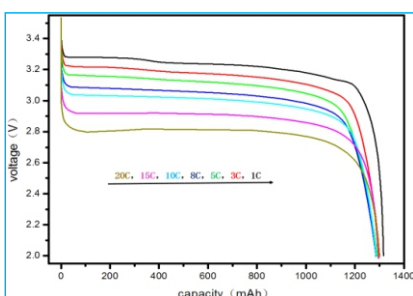
- ✓ 高振实      High tap density
- ✓ 优低温      Excellent low temperature performance
- ✓ 高倍率      High rate

适用于快充、超低温动力电池、启停电源

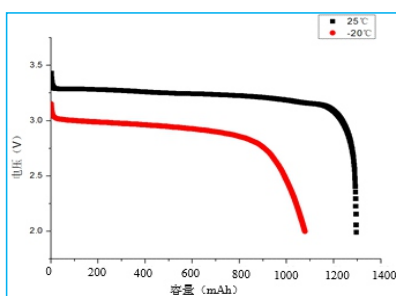
Applicable to fast charge, ultra-low temperature lithium ion battery and start-stop power supply

型号 model	D50 μm	碳量 carbon content %	压实密度 compaction density g/cc	粉体振实 powder tap density g/cm <sup>3</sup>	比表面积 / SSA m <sup>2</sup> /g	首次容量 initial specific capacity (half cell) (0.1C) mAh/g	首次效率 initial coulombic efficiency(half cell) %
T1	2.5±1	1.5±0.2	≥2.5	≥1.0	8.0±2.0	≥156	≥95
T2	7.0±2	1.5±0.2	≥2.0	≥1.3	8.0±2.0	≥158	≥95

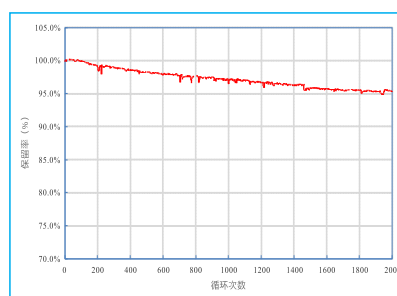
T2全电池不同倍率下放电曲线  
discharge curves in different rates(18650 cell)



T2全电池0.2C低温放电曲线  
discharge curves (18650 cell, -20°C, 0.2C)



T2全电池常温1C循环曲线  
cycling performance (18650 cell, 1C/1C, 25°C)



# CATHODE MATERIAL

## 正极材料

### 磷酸铁锂正极材料——P198-S 系列

Lithium iron phosphate cathode materials-P198-S Series

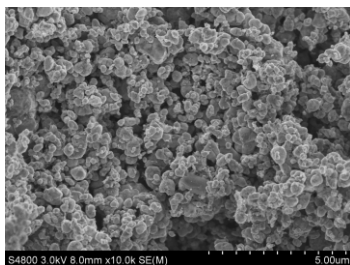
- ✓ 高容量 High capacity
- ✓ 高压实 High compaction density
- ✓ 循环优异 Excellent cycling performance

适用于EV、储能、启停电源等

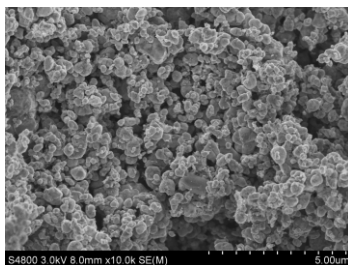
Applicable to high rate lithium ion batteries and ESS batteries

型号 model	D50 $\mu\text{m}$	比表面积/SSA $\text{m}^2/\text{g}$	碳量/ carbon content %	极片压实/ compaction density $\text{g}/\text{cm}^3$	1C克容量/ specific capacity (18650 cell, 1C rate) $\text{mAh}/\text{g}$	循环/ cycling performance %
P198-S13	$1.1 \pm 0.5$	$12.0 \pm 2.0$	$1.45 \pm 0.2$	2.35-2.45	142-145	6000th $\geq 80\%$
P198-S20	$1.1 \pm 0.5$	$11.5 \pm 2.0$	$1.50 \pm 0.2$	2.45-2.55	143-146	4000th $\geq 80\%$
P198-S25	$1.0 \pm 0.5$	$11.5 \pm 2.0$	$1.45 \pm 0.2$	2.30-2.35	143-145	3000th $\geq 80\%$
P198-S26	$0.8 \pm 0.5$	$11.5 \pm 2.0$	$1.55 \pm 0.2$	2.25-2.30	143-145	3000th $\geq 80\%$
P198-S27	$1.3 \pm 0.5$	$13.5 \pm 2.0$	$1.45 \pm 0.2$	2.50-2.65	143-145	4000th $\geq 80\%$

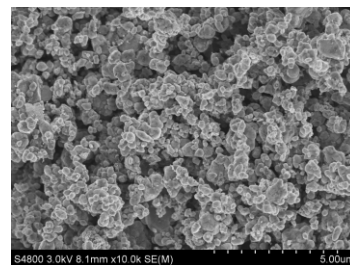
SEM 形貌图



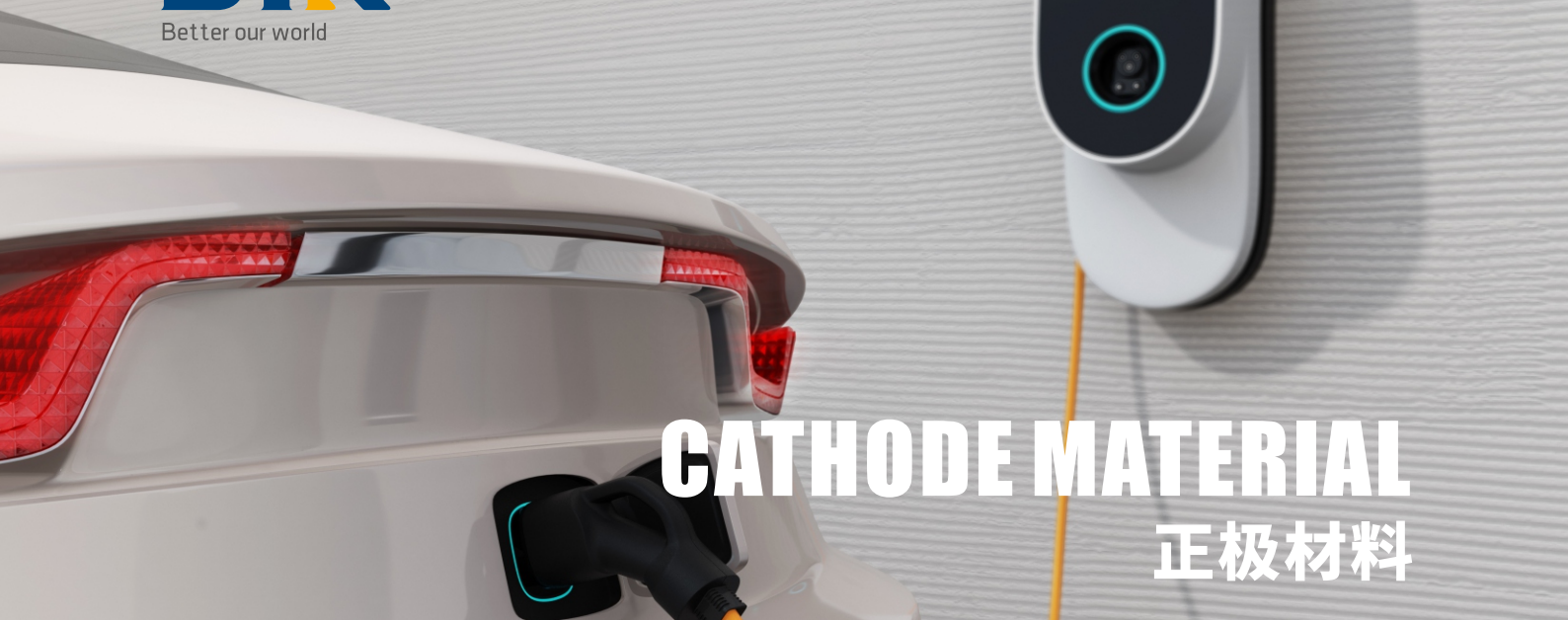
P198-S25



P198-S26



P198-S27



# CATHODE MATERIAL

## 正极材料

### 高镍正极材料——NCA系列

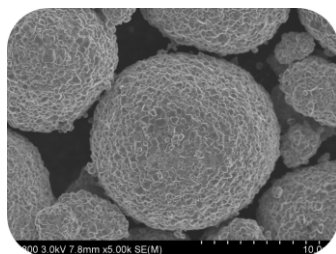
NCA nickelic cathode materials

- ✓ 高容量 High capacity
- ✓ 易加工 Good processability
- ✓ 长循环 Long Cycle life

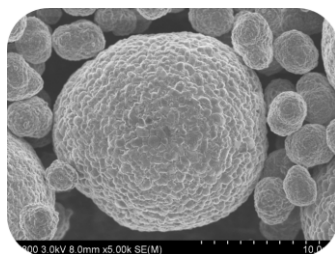
适用于动力型锂离子电池, 数码型锂离子电池  
Applicable to lithium ion battery for EV and 3C field

型号 model	特征 features	D50 μm	LiOH wt%	Li2CO3 wt%	比表面积 / SSA m <sup>2</sup> /g	容量 capacity mAh/g	首次效率 initial coulombic efficiency(half cell) %
N8-L	低成本 Cost-effective	11.5±1.0	≤0.15	≤0.35	1.8±0.5	205.0±3.0	88.0±1.0
N8-B	长循环 Long Cycle life	11.5±1.0	≤0.30	≤0.30	0.8±0.4	208.0±3.0	88.0±1.0
N8-F	高倍率 High rate	13.0±1.0	≤0.65	≤0.65	0.3±0.1	210.0±3.0	88.0±1.0
N9-C	高容量 high specific capacity	11.5±1.0	≤0.30	≤0.30	0.8±0.4	215.0±3.0	88.0±1.0

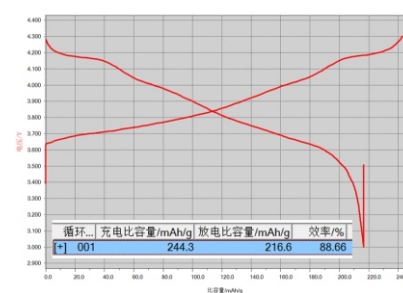
SEM N8-L 形貌图

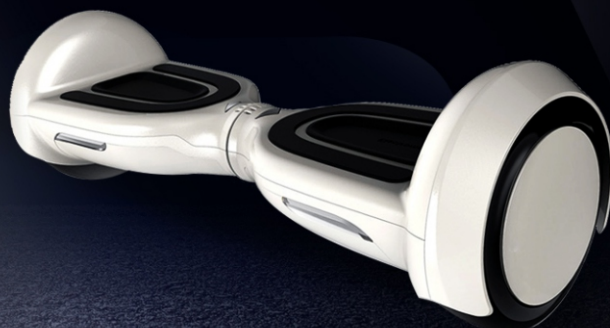
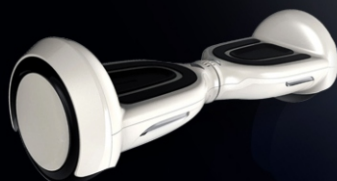


SEM N8-F 形貌图



N9-C充放电曲线/charge-discharge curve





# CATHODE MATERIAL

## 正极材料

### 高镍正极材料——NCM系列

NCM high nickel cathode materials-NCM series

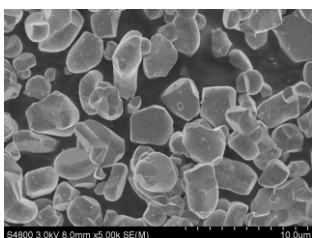
- ✓ 高容量 High capacity
- ✓ 易加工 Good processability
- ✓ 长寿命、存储性能优良 Long cycle life and good storage performance

圆柱、软包和方壳电池以及3C消费电子、电动工具、储能和电动汽车用电池

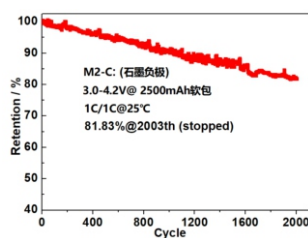
Applicable to cylinder, pouch and prismatic batteries in 3C consumer electronics, power tools, energy storage and electric vehicle

型号 model	特征 features	D50 μm	LiOH wt%	Li <sub>2</sub> CO <sub>3</sub> wt%	比表面积 / SSA m <sup>2</sup> /g	容量 capacity mAh/g	首次效率 initial coulombic efficiency(half cell) %
M1-S1	Ni=0.67, 单晶 single crystal	3.5±1.0	≤0.20	≤0.20	0.6±0.2	190±3	88±1
M2-C	Ni=0.83, 低成本 low cost	10.0±1.0	≤0.30	≤0.30	0.6±0.2	210±3	90±1
M2-C2	Ni=0.83, 高压实 high press density	11.5±1.0	≤0.30	≤0.30	0.6±0.2	210±3	90±1
M8-S	Ni=0.88, 单晶 single crystal	3.5±1.0	≤0.30	≤0.30	0.6±0.2	218±3	88±1
M8-C	Ni=0.88, 高容量 high specific capacity	11.5±1.0	≤0.30	≤0.30	0.6±0.2	220±3	90±1

SEM M1-S1 形貌图



M2-C循环图/cycle diagram





# CATHODE MATERIAL

## 正极材料

### 磷酸铁锂正极材料-Z系列

Lithium iron phosphate cathode materials-Z Series

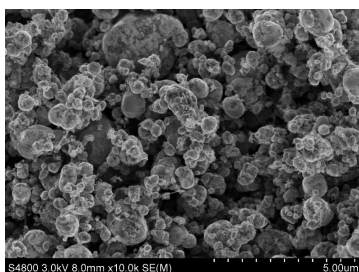
- |       |                               |
|-------|-------------------------------|
| ✓ 低成本 | Cost-effective                |
| ✓ 长循环 | Long Cycle life               |
| ✓ 易匹配 | Easy to match anode materials |

适用于储能和两轮动力

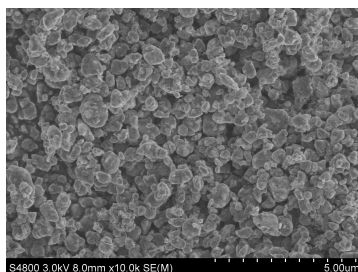
Applicable to EES Batteries and two-wheel electric vehicle

型号 model	D50 μm	碳量 carbon content %	压实密度 compaction density g/cc	粉体振实 powder tap density g/cm <sup>3</sup>	比表面积 / SSA m <sup>2</sup> /g	容量 capacity mAh/g	首次效率 initial coulombic efficiency(half cell) %
Z1	1.0±0.5	3.5±0.5	≥2.1	≥0.6	12.5±2.5	≥148	≥95
Z2	1.0±0.5	3.2±0.5	≥2.1	≥0.6	20±5	≥153	≥96

SEM Z1 形貌图



SEM Z2 形貌图





# SOLID ELECTROLYTE

## 固态电解质

## 氧化物固态电解质

Oxide Solid Electrolyte

### 应用场景

Application Field

#### 1、隔膜涂覆或复合隔膜

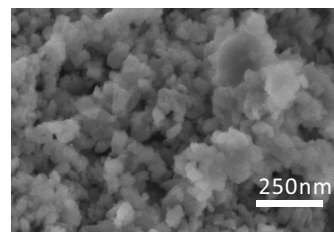
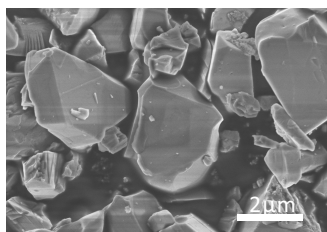
1.Coating or composite separator

#### 2、正极材料表面包覆

2.Cathode Coating Layer

#### 3、制备复合固态电解质材料

3.Composite Solid Electrolyte



型号 model	外观 Appearance	XRD	D50 μm	真密度 True Density (g/cm <sup>3</sup> )	压实 Compaction density (g/cm <sup>3</sup> )	pH	固含量 Solid content (%)	残碱 Residual alkali OH <sup>-</sup> (%)	残碱 Residual alkali CO <sub>3</sub> <sup>2-</sup> (%)	离子电导率 Li <sup>+</sup> Conductivity (S/cm)
BEP-1P	白色粉末 White Powder	无杂相峰 Pure Phase	<8	2.85-3.00	>1.7	6-9	—	0.0	<0.1	>1E-4
BEP-1S	白色浆料 White Slurry	—	100-200	—	—	—	8-12	—	—	>1E-4

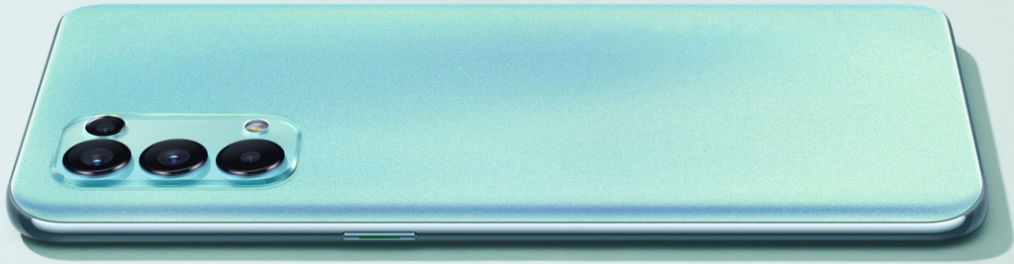
## 原位固化预聚物产品

In-situ polymerized gel electrolyte

低成本，与现有工艺兼容

Low-cost, compatible with existing process

型号 model	外观 Appearance	电导率/ Conductivity (S/cm)	电压稳定/ESW 窗口 (V)	粘度/Viscosity (cp, RT)	密度/Density (g/cm <sup>3</sup> )	水含量/ Water Content (ppm)
BPoly-1	透明液体 Transparent liquid	5E-4	4.3	10-200	1.2	<300
BPoly-2	透明液体 Transparent liquid	4E-4	5.0	15-300	1.3	<300



# GRAPHENE MATERIALS

## 石墨烯材料

### 石墨烯导热膜

Graphene thermal-conductive film

- ✓ 高导电性 Good electro-conductivity
- ✓ 高导热 High thermal conductivity
- ✓ 柔性好 Good flexibility

适用于手机, 平板, PC, 显示屏, 电池等领域  
Suitable for mobile phones, tablets, PCs, display screens, batteries and other fields

Graphene Film							
产品编号 Order code	厚度 (um)	热导率 (Wm-1K-1)	热扩散 (mm <sup>2</sup> /s)	密度 (g/cm <sup>3</sup> )	比热 (J/gk)	电导率 (S/m)	拉伸强度 (Mpa)
GF-H040	40±2%	≥1300±5%	≥750±5%	2.0±0.2	0.85	≥10 <sup>5</sup>	≥40
GF-H080	80±2%	≥1300±5%	≥750±5%	2.0±0.2	0.85	≥10 <sup>5</sup>	≥40
GF-H100	100±3%	≥1300±5%	≥750±5%	2.0±0.2	0.85	≥10 <sup>5</sup>	≥40
GF-H150	150±5%	≥1200±5%	≥750±5%	2.0±0.2	0.85	≥10 <sup>5</sup>	≥40
GF-H170	170±5%	≥1150±5%	≥720±5%	2.0±0.2	0.85	≥10 <sup>5</sup>	≥40
GF-H200	200±5%	≥1100±5%	≥700±5%	2.0±0.2	0.85	≥10 <sup>5</sup>	≥40
GF-H300	300±5%	≥900±5%	≥600±5%	2.0±0.2	0.85	≥10 <sup>5</sup>	≥40
可定制的厚度 (30um-350um)							



# GRAPHENE MATERIALS

## 石墨烯材料

### 石墨烯量子点

Graphene quantum dots

产品名称	粒径尺寸 (D50, nm)	厚度 (nm)	杂原子含量 (at.%)	备注
石墨烯量子点	≤ 30	≤ 1.0	20 ± 5%	尺寸可定制化
氧化石墨烯量子点	≤ 30	≤ 1.5	30 ± 5%	尺寸可定制化
氮掺杂石墨烯量子点	≤ 30	≤ 2.0	30 ± 5%	高氮掺杂, 高纯度
硫掺杂石墨烯量子点	≤ 30	≤ 2.0	10 ± 5%	高纯度

### 石墨烯原材料

Graphene raw materials

- ✓ 高导电性 High conductivity
- ✓ 高导热 High thermal conductivity
- ✓ 成本低 low cost

石墨烯层数为1~5层,产率>95%

The number of graphene layers is 1~5, and the yield is >95%

产品名称	粒径尺寸 (D50, μm)	厚度 (nm)	碳含量 (at.%)	电导率 (S/cm)	备注
纳米石墨烯	≤ 1	≤ 3	97 ± 2	20-60	提供水性浆料或定制化溶剂
亚微米石墨烯	1-2	≤ 3	98 ± 2	200-400	粉体或定制化浆料
定制化石墨烯	3-15	≤ 5	99 ± 1	700-1200	粉体或定制化浆料



# COOPERATION

BUY BETTER, BUY BTR

新能源材料领域全球领先企业

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