

Ref. No.: SYN11/PS202112/01

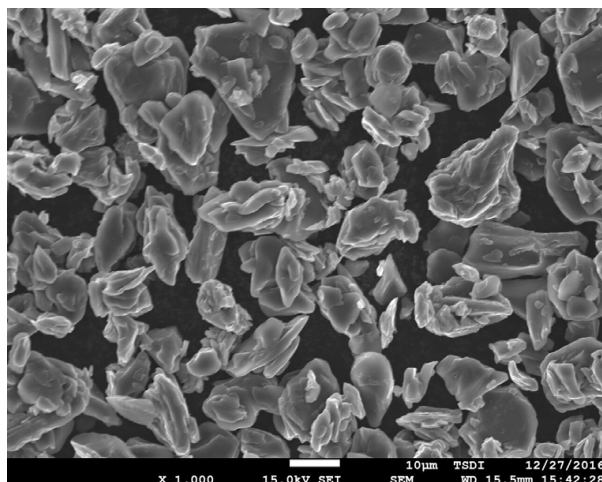
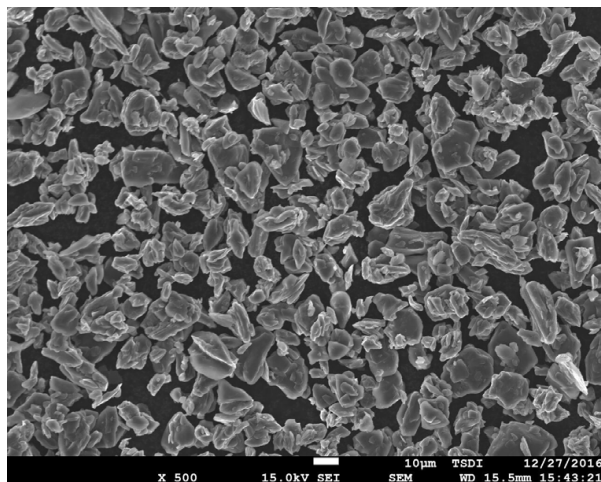
Last Update: 6 December 2021

SYN-11 Product Specification

Applications: high-capacity cylindrical, square, pouch batteries and other power batteries.

1. Technical characteristics:
SYN-11 is a synthetic graphite product of secondary granulation which has the characteristics of high specific capacity, high rate charge-discharge performance, good cycling performance, balanced performance at high and low temperature, and excellent processing performance.
2. Suggested usage: (For reference only)
Suitable for aqueous lithium-ion secondary batteries with design specific capacity at 340-345mAh/g, pellet density at 1.55-1.65g/cm³.

Scanning Electron Microscope



3. Technical Data

Item	Unit		Typical Value	Specification	Testing Method/ Instrument
Particle Size	D10	μm	5.776	≥4.5	Laser diffraction Malvern Mastersizer 3000
	D50	μm	11.097	11.0±2.0	
	D90	μm	20.984	≤28.0	
	D100	μm	33.493	< 52	
Tap Density	g/ml		1.18	> 1.05	Central Iron & Steel Research Institute Model: FZS4-4B
Special Surface Area	m ² /g		1.57	1.5±0.5	Multi point BET (adsorption N ₂) Quantachrome Nova 4000E
Moisture	%		0.10	≤0.2	Gravimetric method Mettler Toledo ME204T/02 Standard Analytical Balance
Ash	%		0.02	≤0.1	Gravimetric method, Muffle furnace 950°C
Pellet Density	g/cm ³		1.63	1.55-1.65	Guangzhou Lange Electronics Model: CLG-ZM-400Y
Specific Capacity	mAh/g		355	> 350	Half-Cell Testing, using lithium metal as counter electrode Arbin multifunctional battery testing equipment Model: BT2000
Initial Coulombic Efficiency	%		92.5	≥92	

4. Formulation and procedures of anode material production: (for reference only)

Proportion	SYN-11 : CMC : SBR : SP = 95.5 : 1.5 : 2.0 : 1
Bonding Agent	CMC2200 (Japan Daicel Corporation) SBR307 (Nippon A&L Inc.)
Solid content	45%
Viscosity	3000 mpa.s
Mixing equipment	Blender (Hongyun)

Feeding order and procedures:

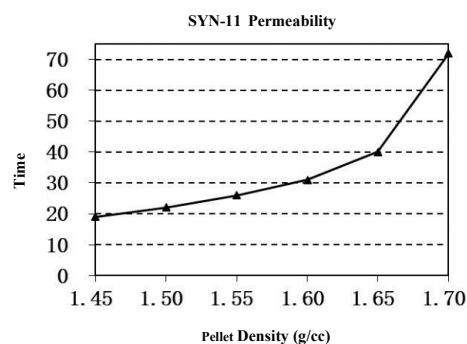
1. After being weighted, CMC be put into 90% first batch of water and mix for 2.0 hours (rotation/revolution speed: 30/25Hz).
2. Add Super-p and mix for 2.0 hours (rotation/revolution speed 30/25Hz).
3. Add SYN-11 and mix for 2.0 hours (rotation/revolution speed 20/25Hz).
4. Add SBR and mix for 1.5 hours (rotation/revolution speed 25/20Hz).
5. Measure the viscosity.
6. Depends on the viscosity, add 10% second batch of water and mix 1.0 hour (rotation/revolution speed 30/25Hz). Adding second batch of water is for adjusting viscosity purpose.
7. Mix at a low speed for 30 minutes (rotation/revolution speed 5/10Hz).

5. Absorbent permeability test in different pellet density

Measurement setup:

Absorbent:

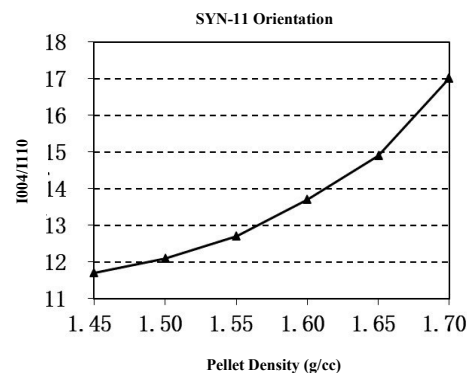
LiPF₆: 1mol/L,
EC : DEC : DMC = 1 : 1 : 1,
Volume: 1μL



6. Test of orientation in graphite sheet electrode

Measurement setup:

1. Equipment: X-ray diffraction (XRD)
2. Graphite sheet electrode
3. formulation:
SYN-11 : CMC : SBR : SP = 95.5:1.5: 2.0: 1
Coating: single side
Cufoil: 12μm
4. Scan speed: 0.082
5. Scan step size: 0.0066
6. Scan angle: I004 (52~56 degree); I110 (75~79 degree)



7. Charge/Discharge Scheme

1. Constant-current charging (0.5C, 4.3V)
2. Constant-voltage charging (4.3V, current 48mA)
3. Rest period (10min)
4. Constant-current discharging (0.5C, 3.0V)
5. Rest period (10min)
6. Cycling performance (>300 weeks)

8. Environmental compliance of product

The product complies with EU RoHS Directive (Restriction of Hazardous Substances in Electrical and Electronic Equipment), the concentration of toxic and hazardous substances or elements contained in the product does not exceed the limit specified in SJ/T 11363-2006 “Limit Requirements for Toxic and Hazardous Substances in Electronic Information Products”.

9. Packaging and labelling

The product is packaged by a vacuum packaging machine, first put into an inner film bag, formed, heat-sealed, and then put into a carton with a net weight of 25.0 ± 0.1 kg/carton, or packed according to customer requirements.

The packaging label includes: product name, batch number, packaging specification, production date, factory date, order number, inspection mark, RoHS mark, as well as company name, LOGO, and other customized information.

10. Storage and Transportation

The product should be stored in a ventilated and dry warehouse and avoid mixing with materials that can deteriorate the product or damage the packaging bag during storage and transportation.

Unopened product has 1 year of durability period. Opened product should be used within one month and kept clean and dry.