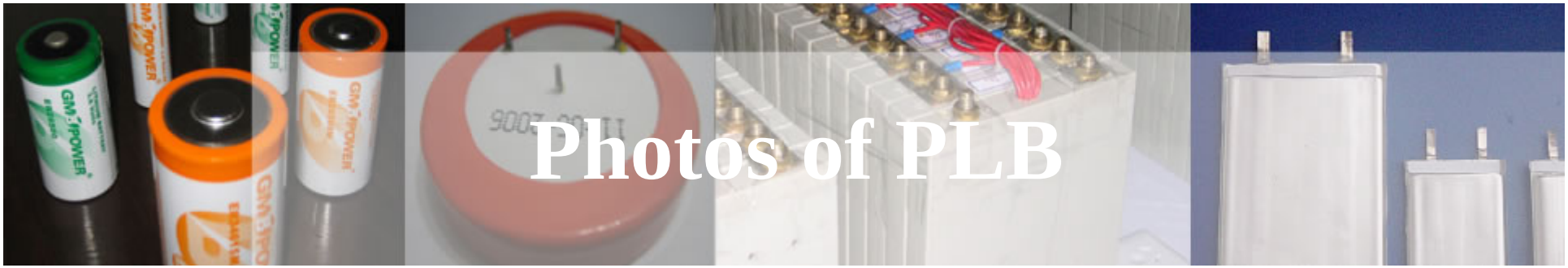
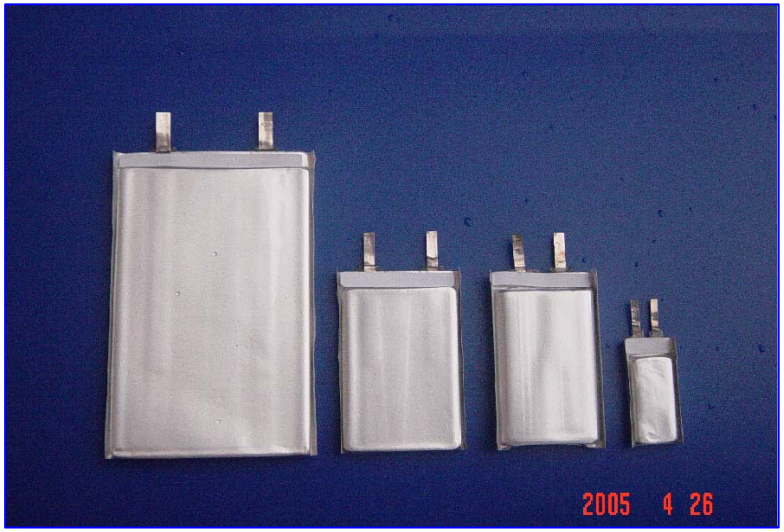
$LiFePO_4$ Battery Introduction

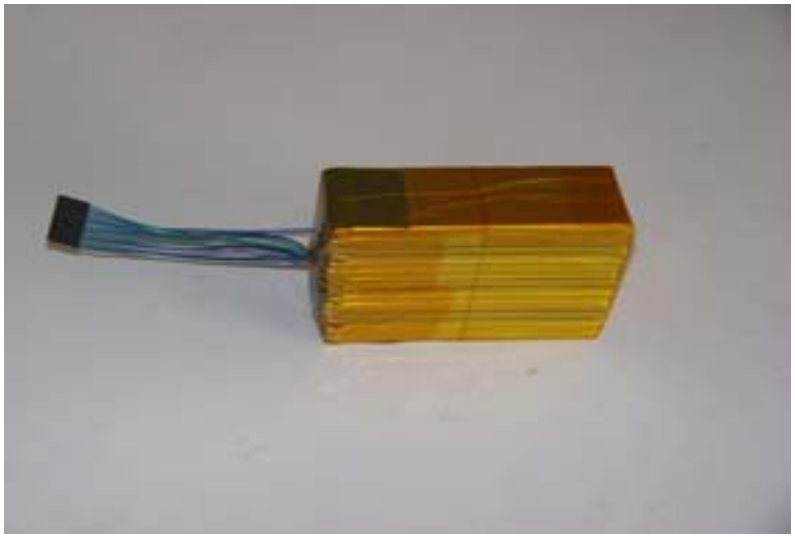
Types of Products

- Normal Polymer Lithium-ion Battery.
  - 40-2000 mAh, <3C.
- High Capacity Polymer Lithium-ion Battery.
  - 2000-25000 mAh, <8C.
- High Power Polymer Lithium-ion Battery.
  - 40-5 mAh, <20C



Photos of PLB

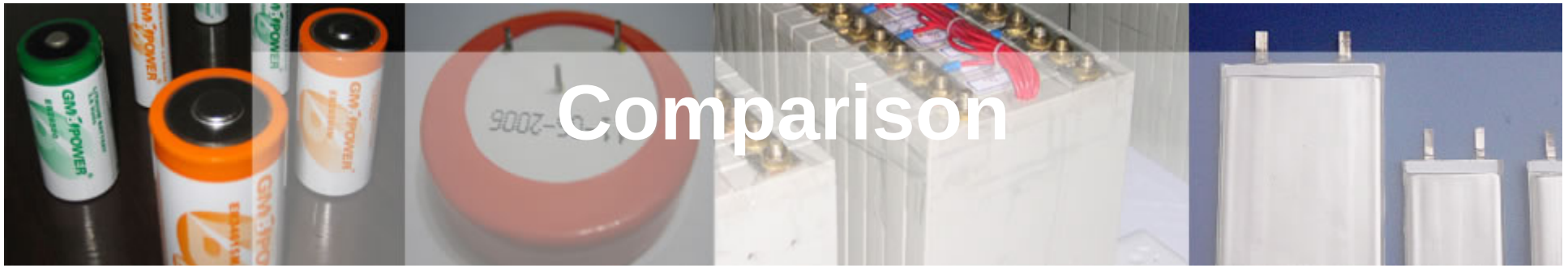




Li-Ion Battery Application

Li-Ion Battery Application

- Normal LFP Battery:
  - Digital electric product.
  - Instrument
  - Light
- High Power Battery:
  - Electric tools
  - Electric toys
  - Module Aeroplanes
- High Capacity Battery:
  - Electric bike.
  - Electric vehicle
  - Storage Power Source.



Comparison

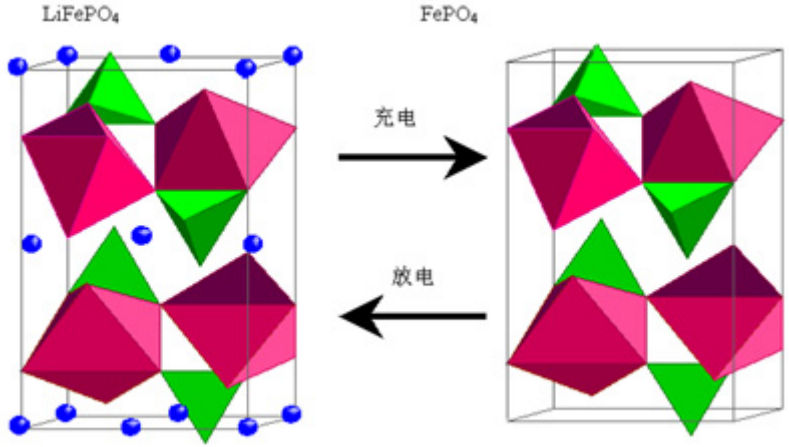
Active Materials	$LiFePO_4$	$LiCoO_2$	$LiMn_2O_4$	$LiNi_xMn_yCo_zO_2$
Specific capacity (mAh/g)	140	140	100	140
Working voltage	3.00	3.60	3.70	3.45
Cycling life (80%)	>1000	>500	>300	>400
High temp. Property	>75℃	55℃	45℃	60℃
Safety	Perfact	Normal	Better	Good
Storage life	Perfact	Good	Normal	Better

$LiFePO_4$ Polymer Battery

- $LiFePO_4$ polymer battery is a new type of lithium ion battery.
- Cathod: $LiFePO_4$
- Anode: Graphite
- Electrolyte: $LiPF_6$/organic solution
- Separator: PP/PE membran film
- Case: Al/PP complex film
- Cell reaction:
- $LiFePO_4 + C_6 \text{ ======== } Li_xC_6 + Li_{1-x}FePO_4$

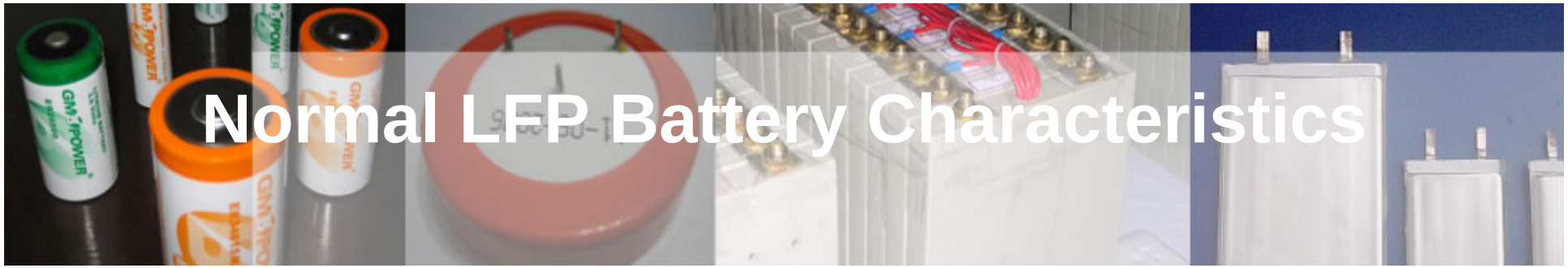
$LiFePO_4$ Material Characteristics

- Stronger Fe-P-O bond than Co-O.
- No exothermic reaction during oxygen loss.
- No lithium remains in full charged $LiFePO_4$.
- No expansion during charging and discharging.



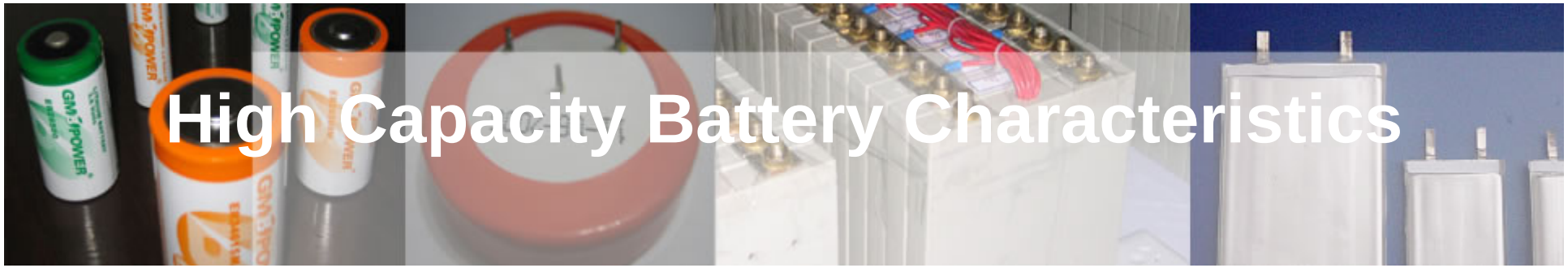
Advantages and Drawbacks

- **Advantages:**
  - High Safety
  - Long cycling life
  - Excellent high temperature performance
  - Low self-discharge
  - High discharging rating
  - Perfact storing life.
- **Drawbacks:**
  - Lower specific capacity than $LiCoO_2$ battery.
  - lower voltage than $LiCoO_2$ battery.



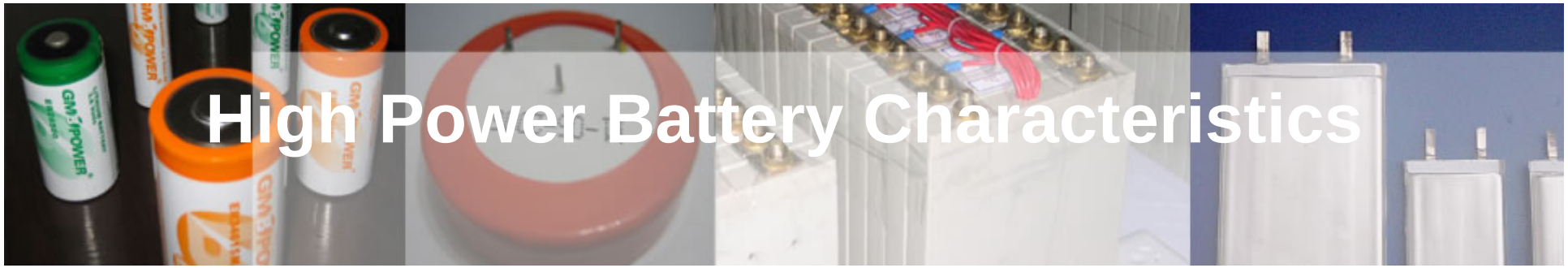
Normal LFP Battery Characteristics

Capacity	0.05-2.0 Ah
Specific capacity	60 mAh/cm^3
Working Voltage range	2.0-3.6V
Discharging Temperature	-20~60 ℃
Standard Discharging current	0.2 C_5A
Max Discharging current	2.0 C_5A
Charging Method	CC/CV
Charging Temperature	0~45 ℃
Standard Charging Current	0.2 C_5A
Max Charging Current	0.5 C_5A
Charging Voltage	3.6 V
Storage Temperature	-10~45 ℃



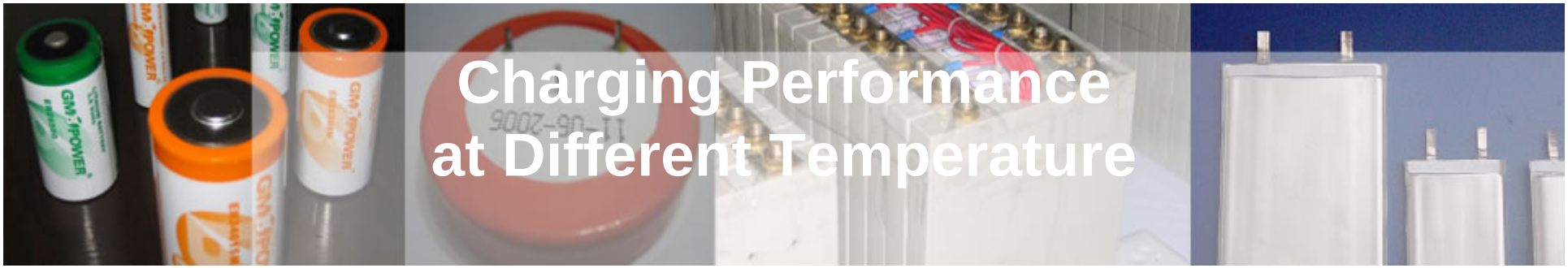
High Capacity Battery Characteristics

Capacity	**>2.0 Ah**
Specific capacity	**60 mAh/cm^3**
Working Voltage range	**2.0-3.6V**
Discharging Temperature	**-20~60 ℃**
Standard Discharging current	**0.2 C_5A**
Max Discharging current	**2 C_5A**
Charging Method	**CC/CV**
Charging Temperature	**0~45 ℃**
Standard Charging Current	**0.2 C_5A**
Max Charging Current	**1 C_5A**
Charging Voltage	**3.6 V**
Storage Temperature	**-10~45 ℃**



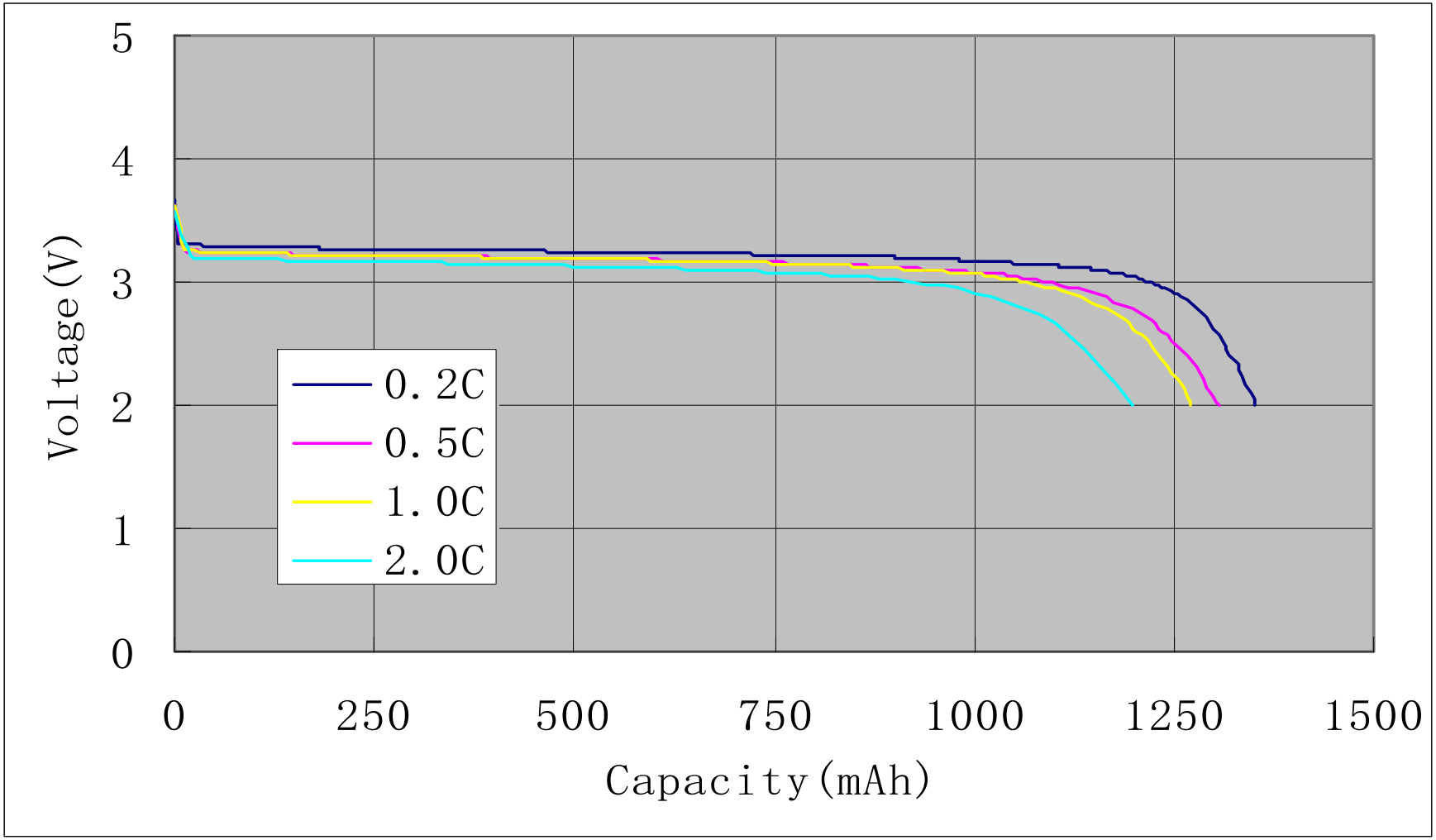
High Power Battery Characteristics

Capacity	0.05～5 Ah
Specific capacity	34 mAh/cm^3
Working Voltage range	2.0-3.6V
Discharging Temperature	-20~75 ℃
Max Discharging current	⩽15C
Charging Method	CC/CV
Charging Temperature	0~45 ℃
Standard Charging Current	1.0 C_5A
Max Charging Current	3.0 C_5A
Charging Voltage	3.6 V
Storage Temperature	-10~45 ℃

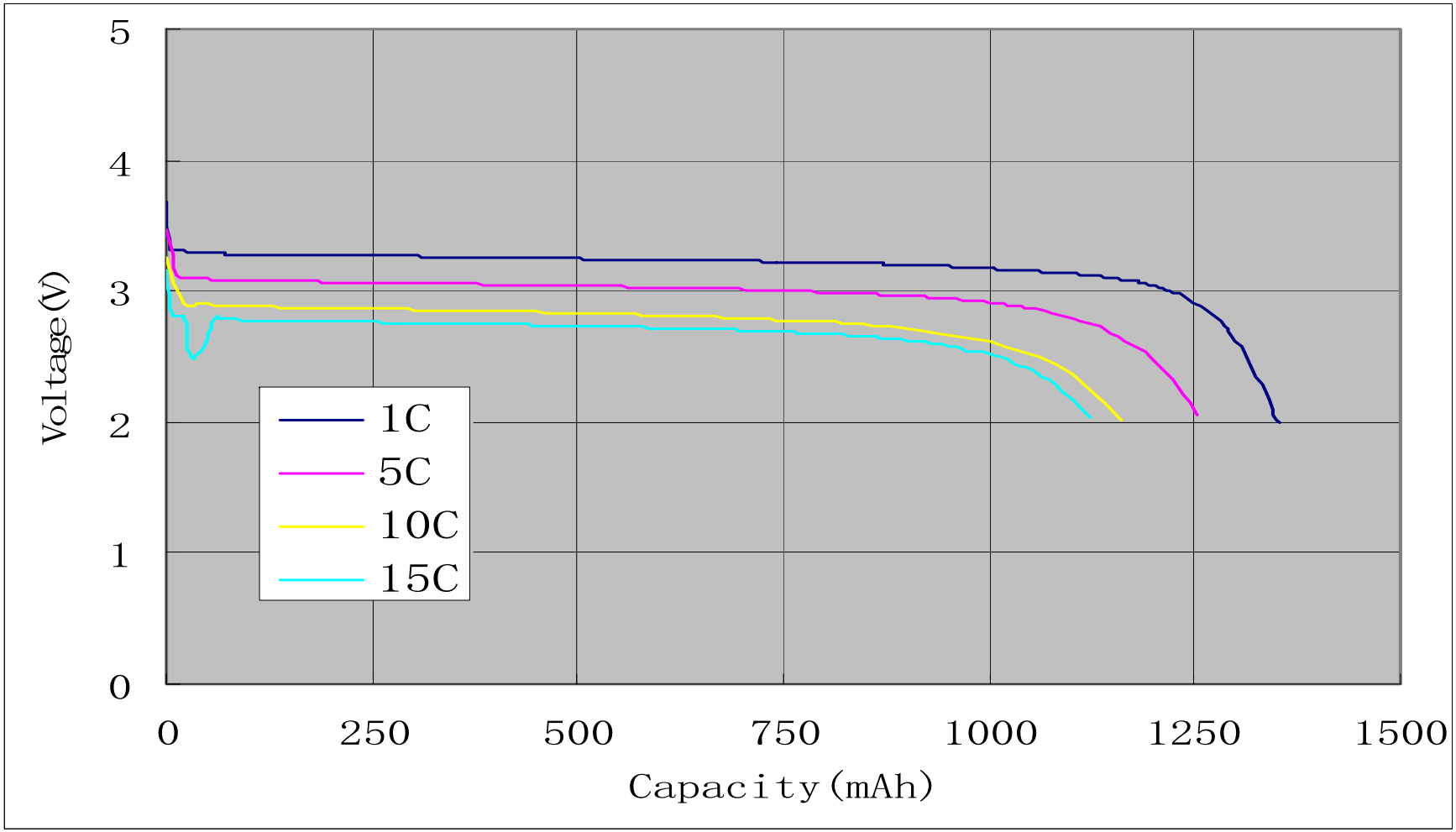


Charging Performance at Different Temperature

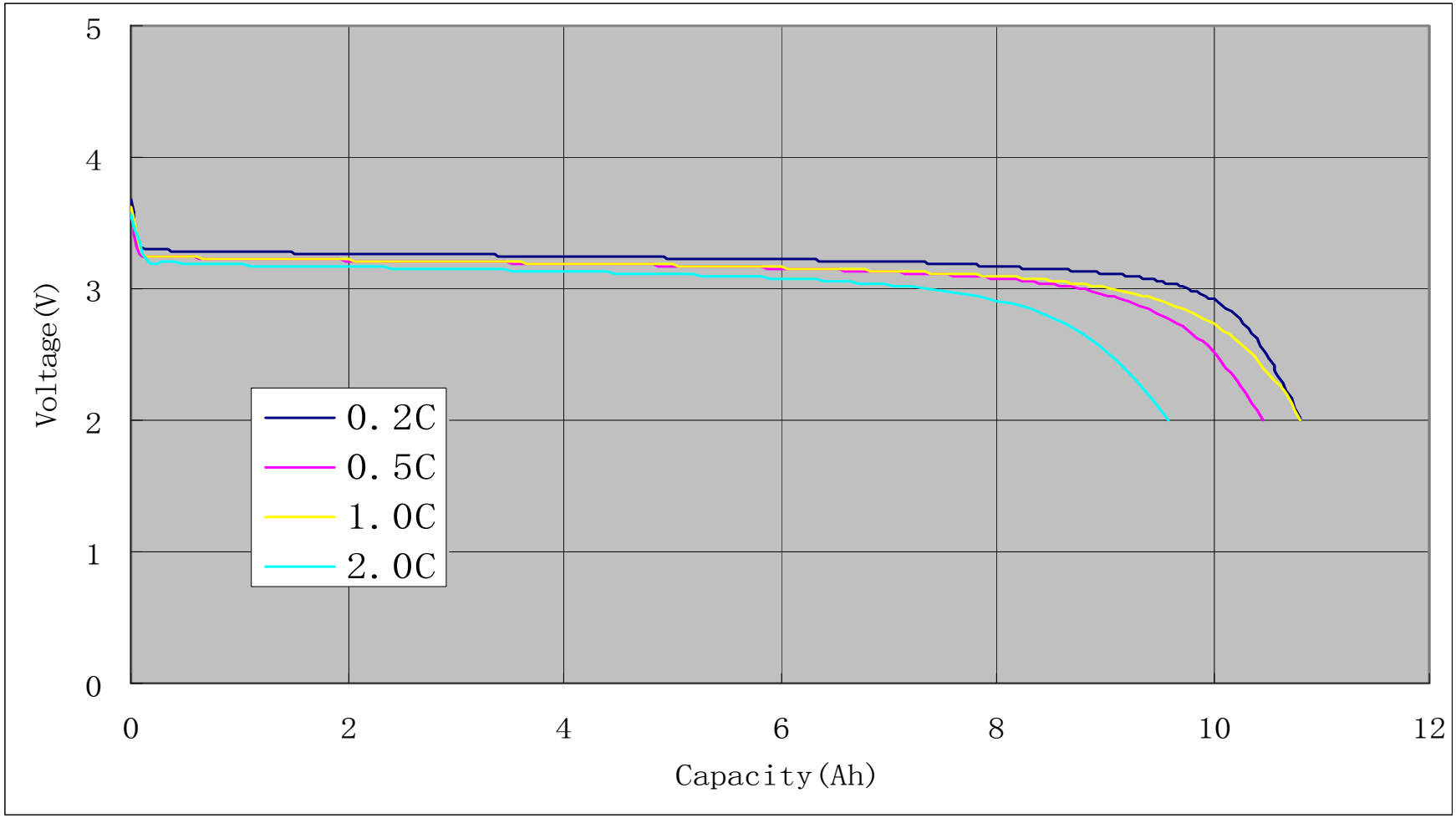
Discharging Performance for Normal LFP Cell at Different Current

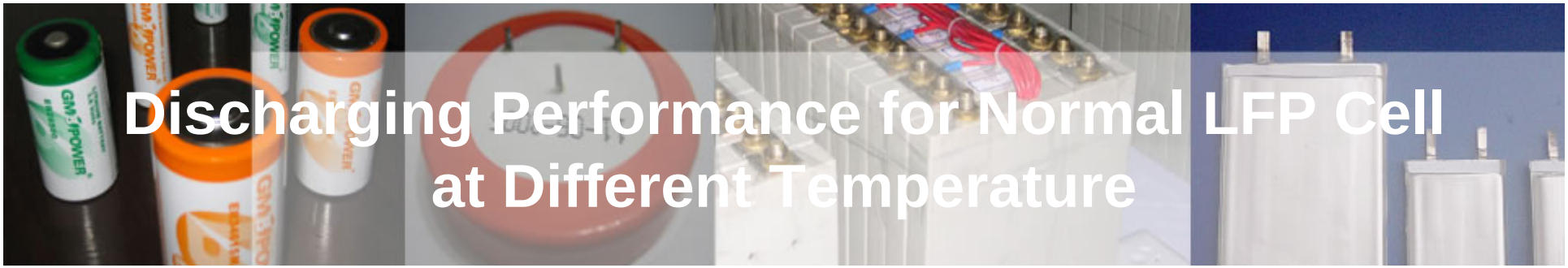


Discharging Performance for High Power LFP Cell at Different Current

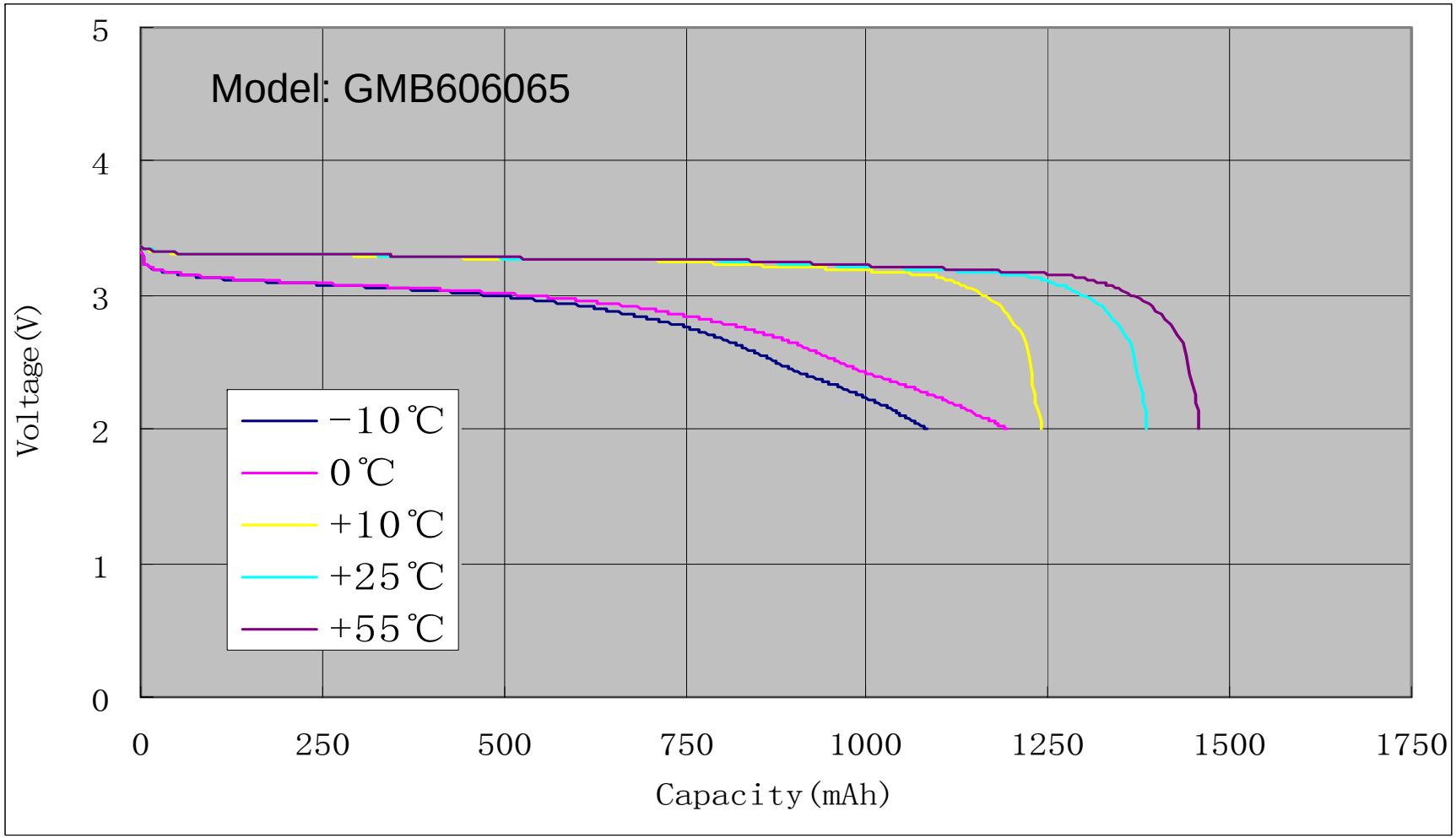


Discharging Performance for High capacity LFP Cell at Different Current

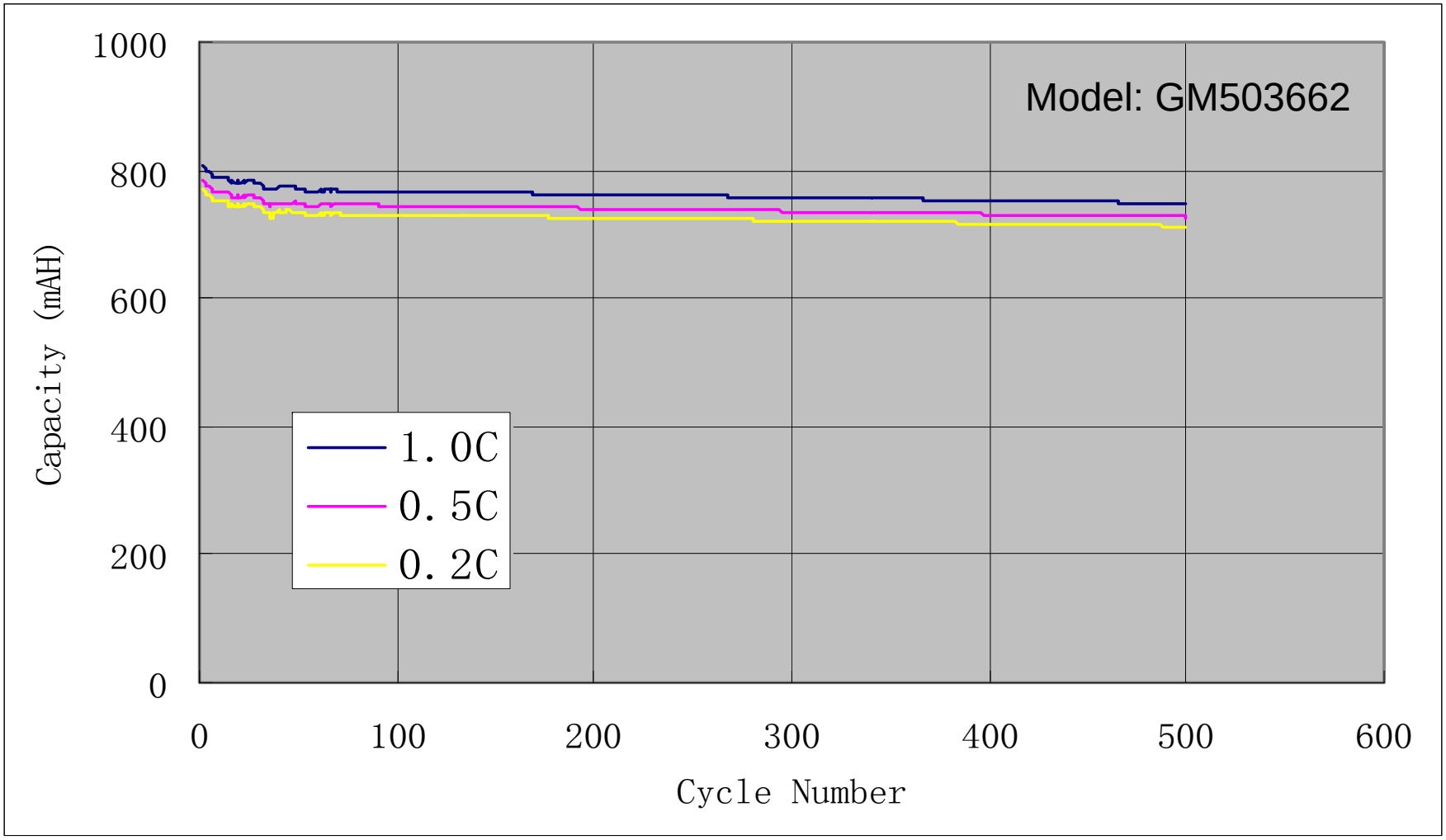




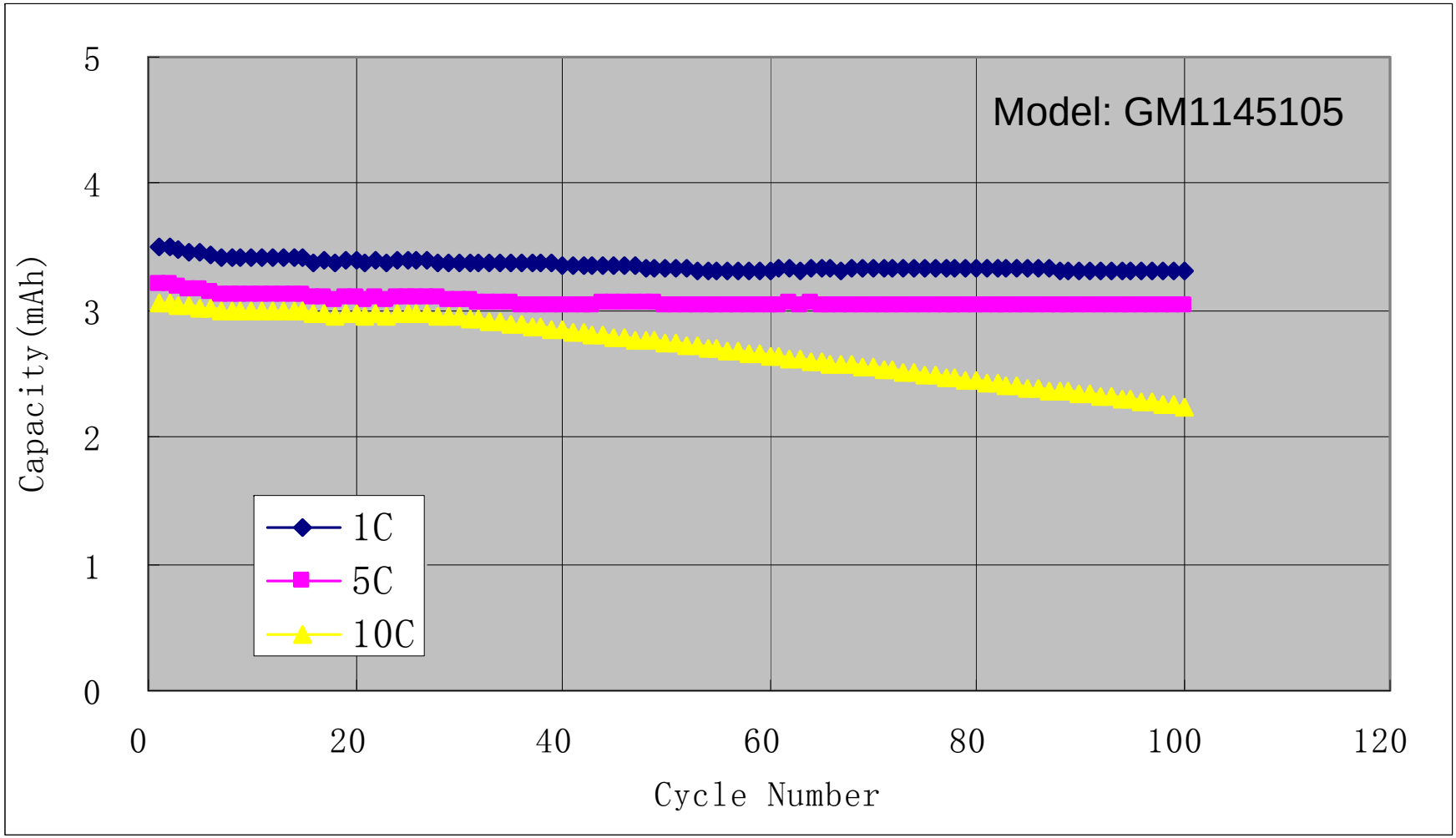
Discharging Performance for Normal LFP Cell at Different Temperature



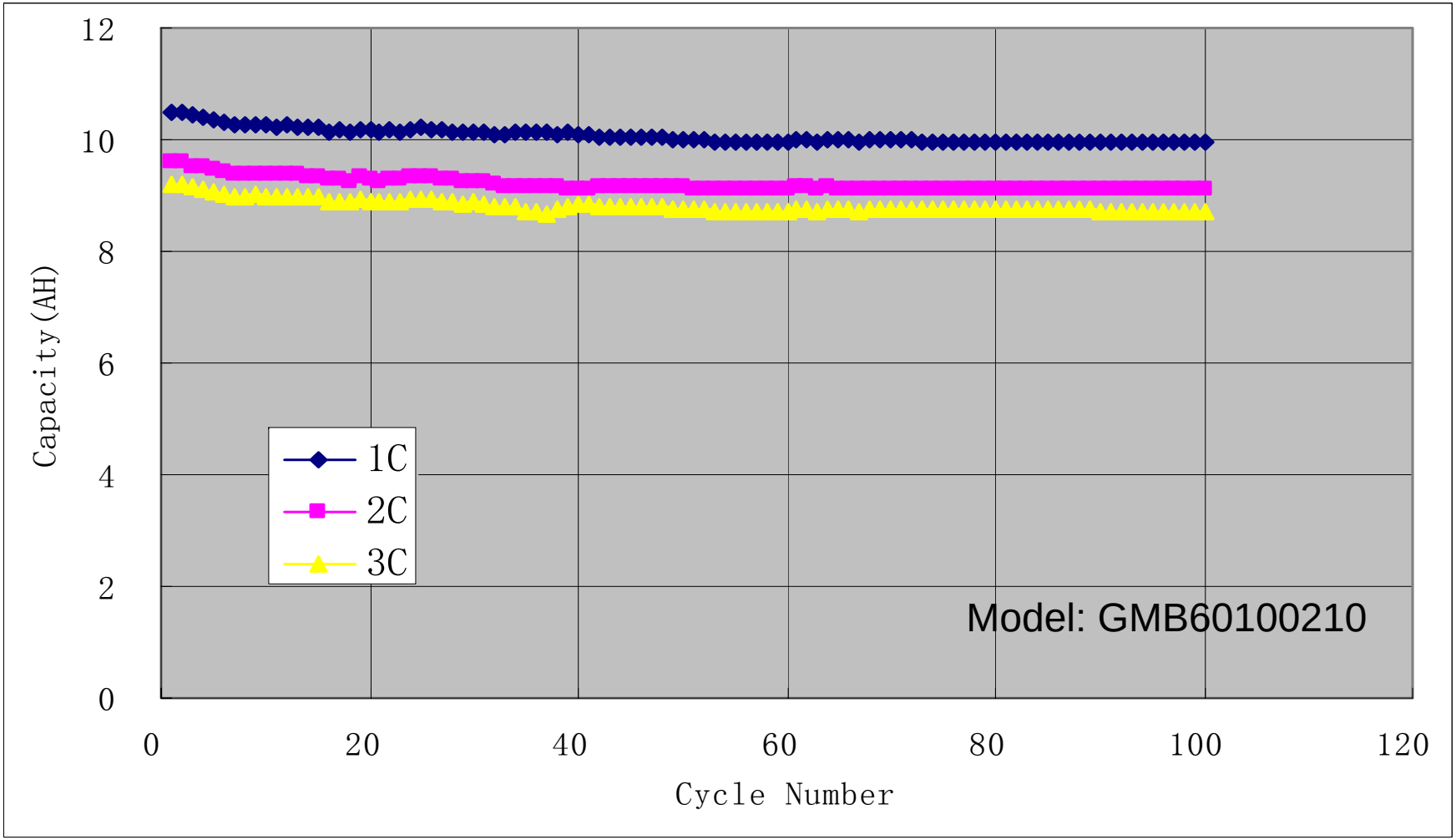
Cycling Performance for Normal LFP Cell at Different Current



Cycling Performance for High Power LFP Cell at Different Current



Cycling Performance for High Capacity LFP at Different Current



Safety Characteristics

Item	Method	Result
Overcharging	3C, 10V	No firing & exploding
Over discharging	1C for 4 hrs.	No firing & exploding
Short-circuit	ER=100 mohm	No firing & exploding
Vibration	100 mins.	No firing & exploding
Drop test	Drop from 1m	No firing & exploding
Nail test	3 mm nail.	No firing & exploding
Crush test	32 mm piston, 13 KN .	No firing & exploding
Hot oven	130℃, 30mins	No firing & exploding

Nail Test Photo

Thanks