



MOLICEL® IHR18650C 2Ah Power cell

2013-01-30

E-ONE MOLI ENERGY CORP

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Confidential

- ❖ **Molicel IHR18650C 2Ah Power cell**
- ❖ **Cell is capable of 20A continuous cycling**
- ❖ **Key Characteristics:**
 - Low cell impedance (~20mΩ 1s pulse DCR)
 - Quick charge
 - – 40°C operation
 - High rate cycle life

- ❖ **Design**
 - NMC Cathode
 - Center Cathode Tab
 - Two Anode Tabs





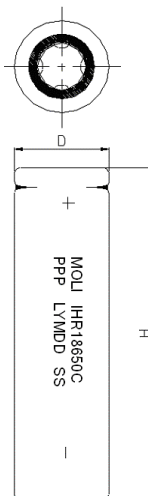
LITHIUM-ION RECHARGEABLE BATTERY

PRODUCT DATA SHEET
MODEL IHR18650C

Performance Characteristics

| | | |
|---------------------|--------------------------------|---|
| Capacity | Typical Minimum | 2050 mAh 2000 mAh |
| Cell Voltage | Nominal Charge Discharge | 3.6 V 4.2 V 2.0 V |
| Charge Current | Nominal Maximum | 2.0 A 6.0 A |
| Charge Time | Nominal | 1.5 hr |
| Discharge Current | Continuous Maximum | 20 A TBD |
| Internal Impedance | AC(1 KHz) DC (10A/1s) | 13 mΩ 20 mΩ |
| Ambient Temperature | Charge Discharge Storage | 0°C to 60°C -40°C to 60°C -20°C to 45°C |
| Energy Density | Specific Volumetric | 160 Wh/kg 425 Wh/l |

Physical Characteristics



Shape
Can

Cylindrical
Steel

Diameter
Height

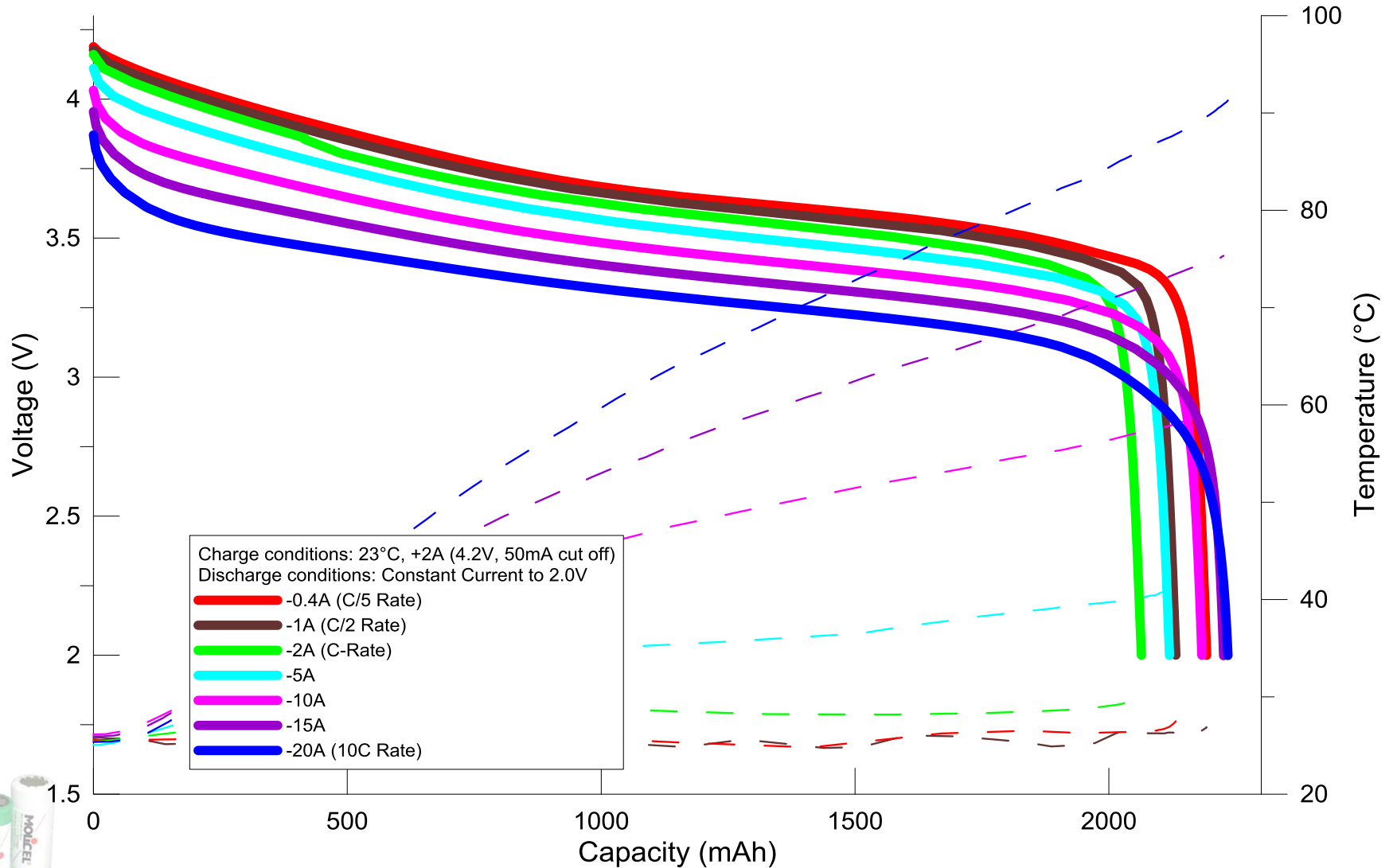
18.6 mm (Max)
65.2 mm (Max)

Weight

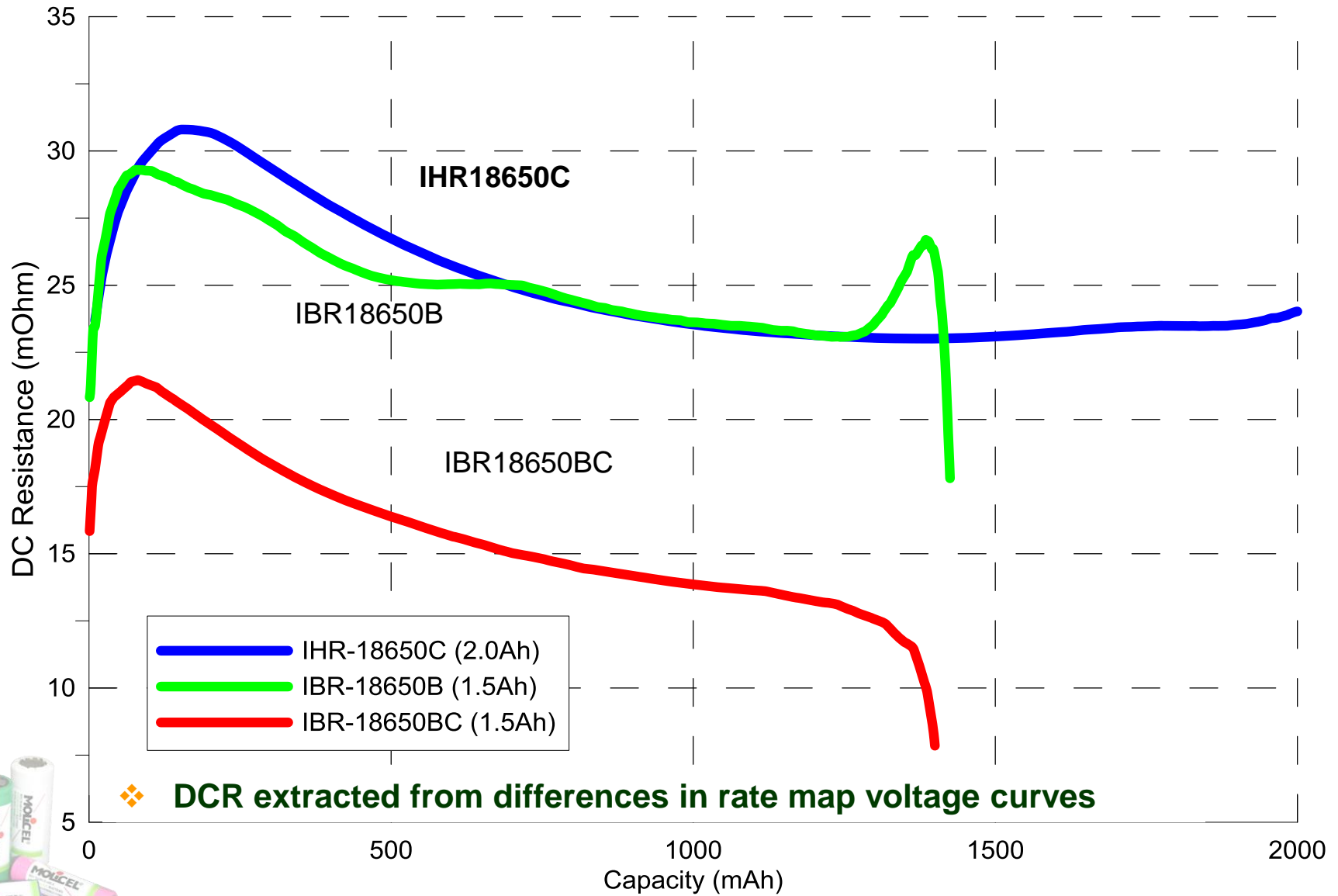
45 g (Max.)



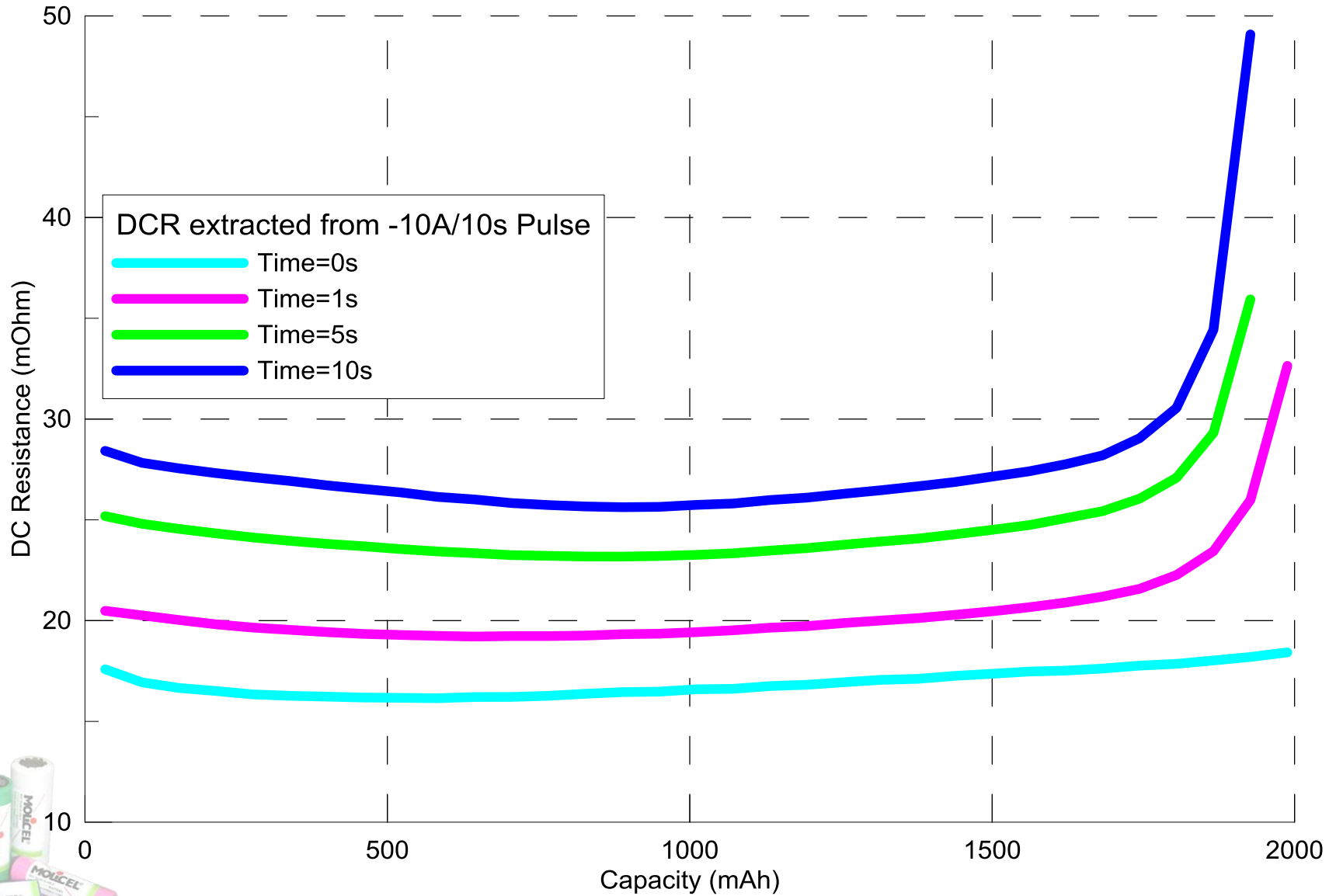
23 °C Rate Map / Voltage Curves



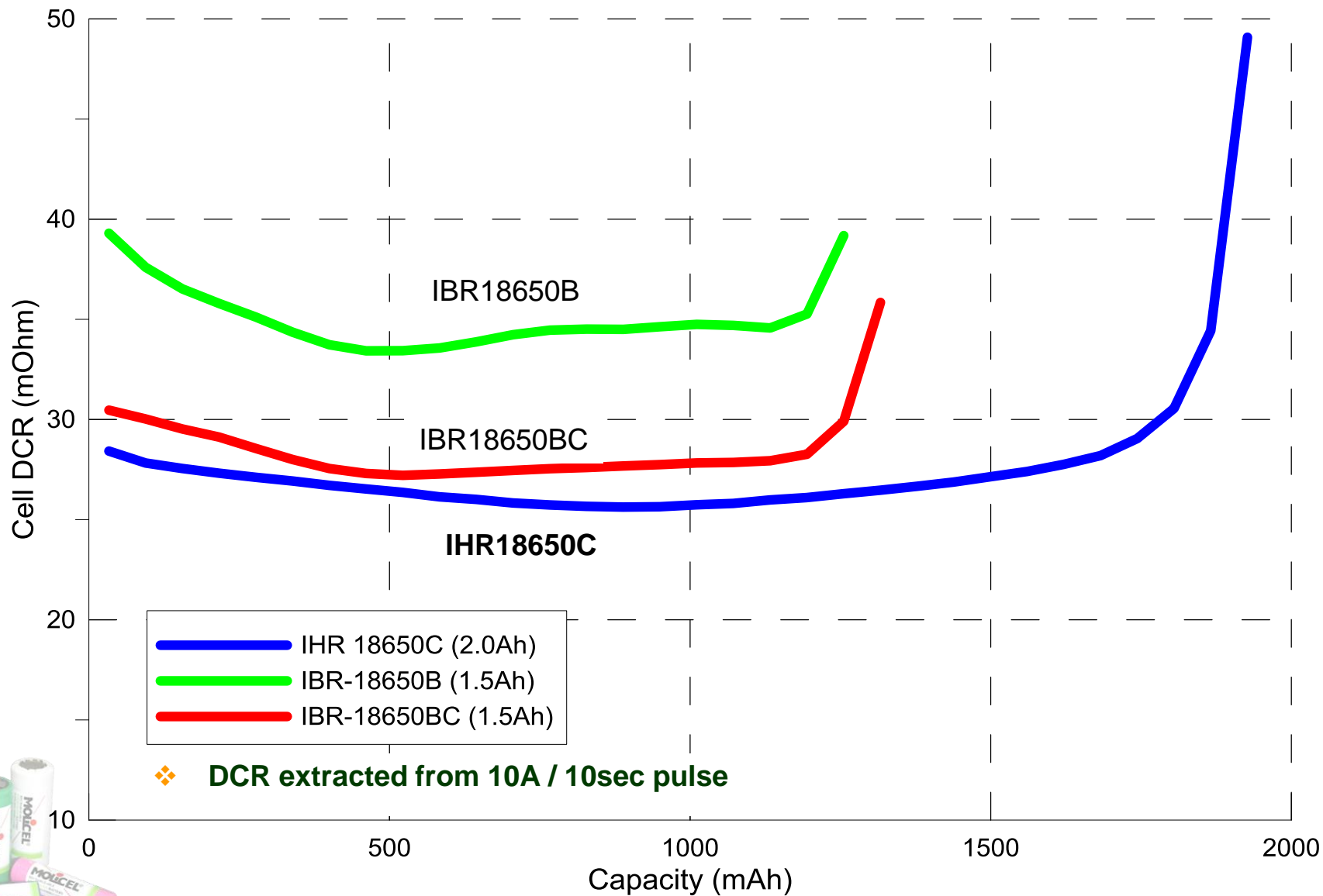
Constant Current DC Resistance



10A Pulse DCR



Pulse DC Resistance Comparison

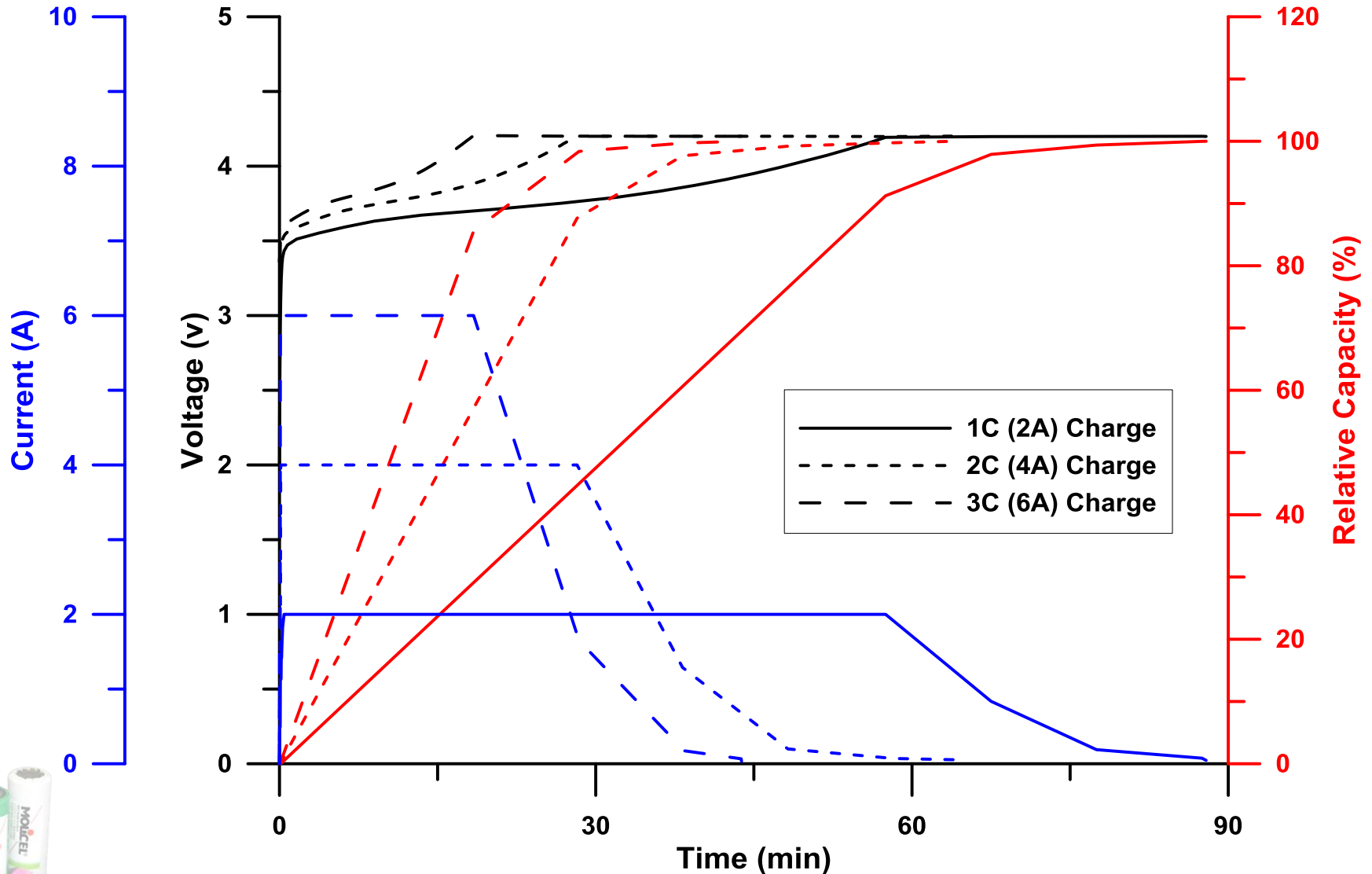


Legend:
IHR 18650C (2.0Ah)
IBR-18650B (1.5Ah)
IBR-18650BC (1.5Ah)

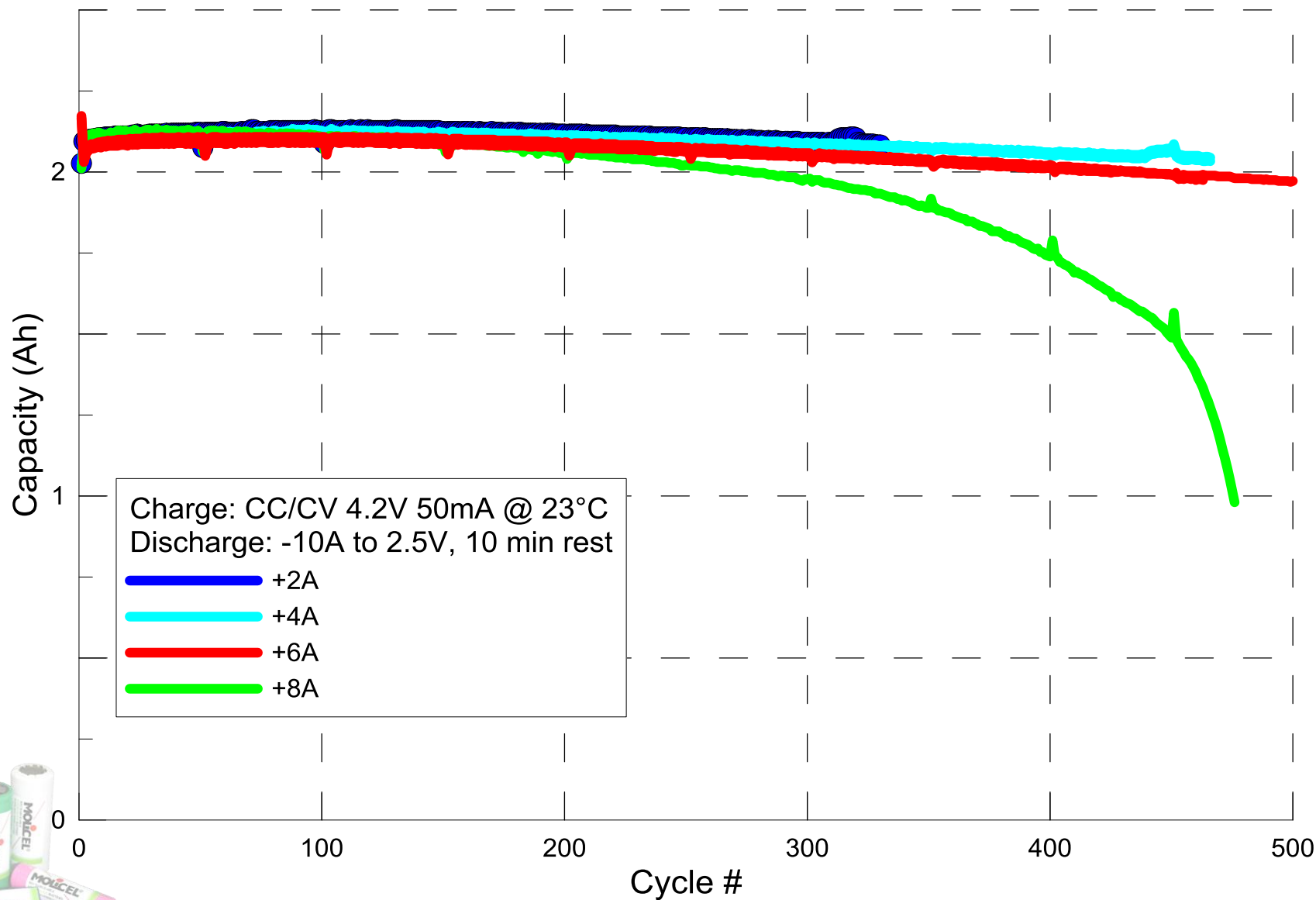
◆ DCR extracted from 10A / 10sec pulse



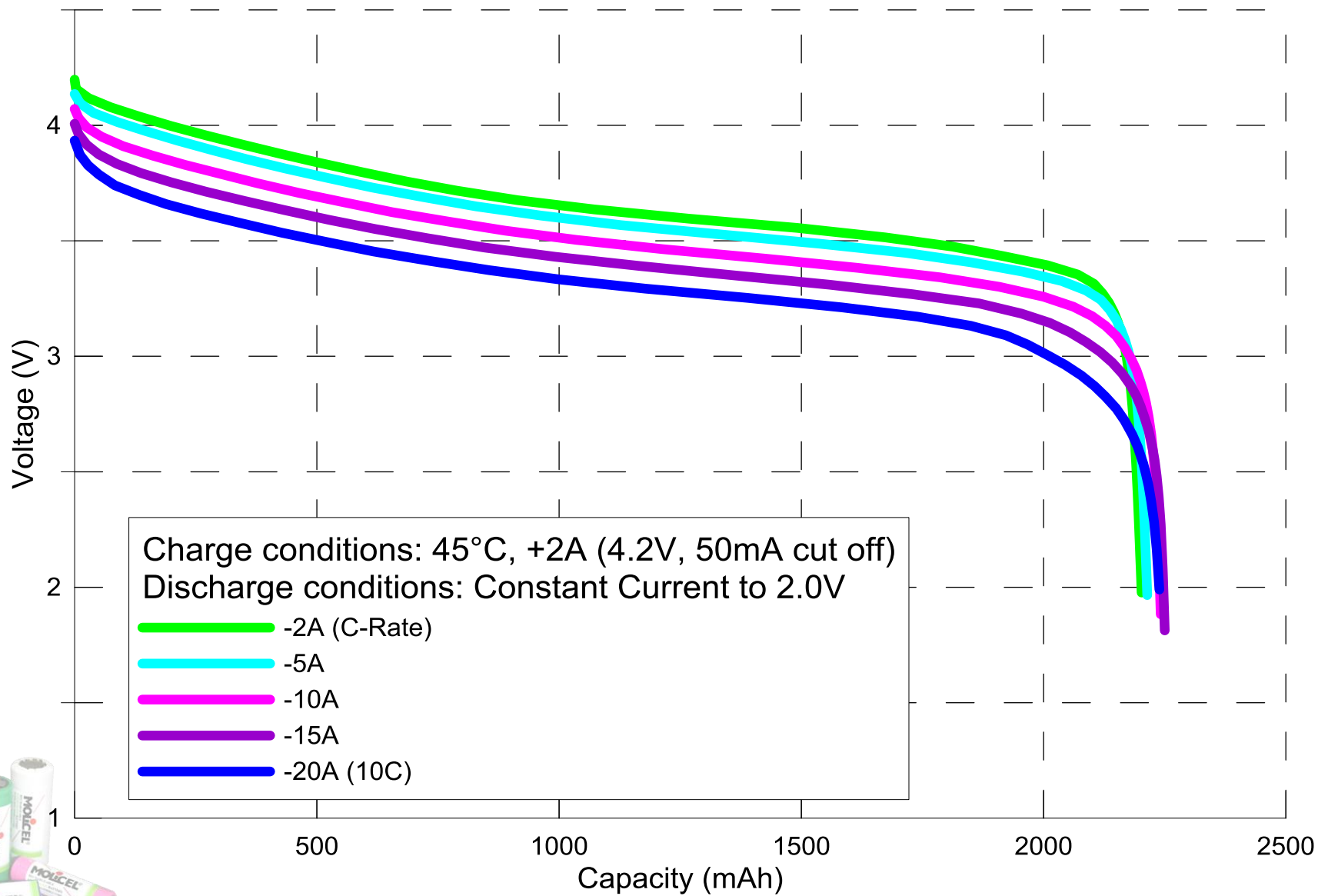
IHR 18650C: 23°C Charge Characteristics



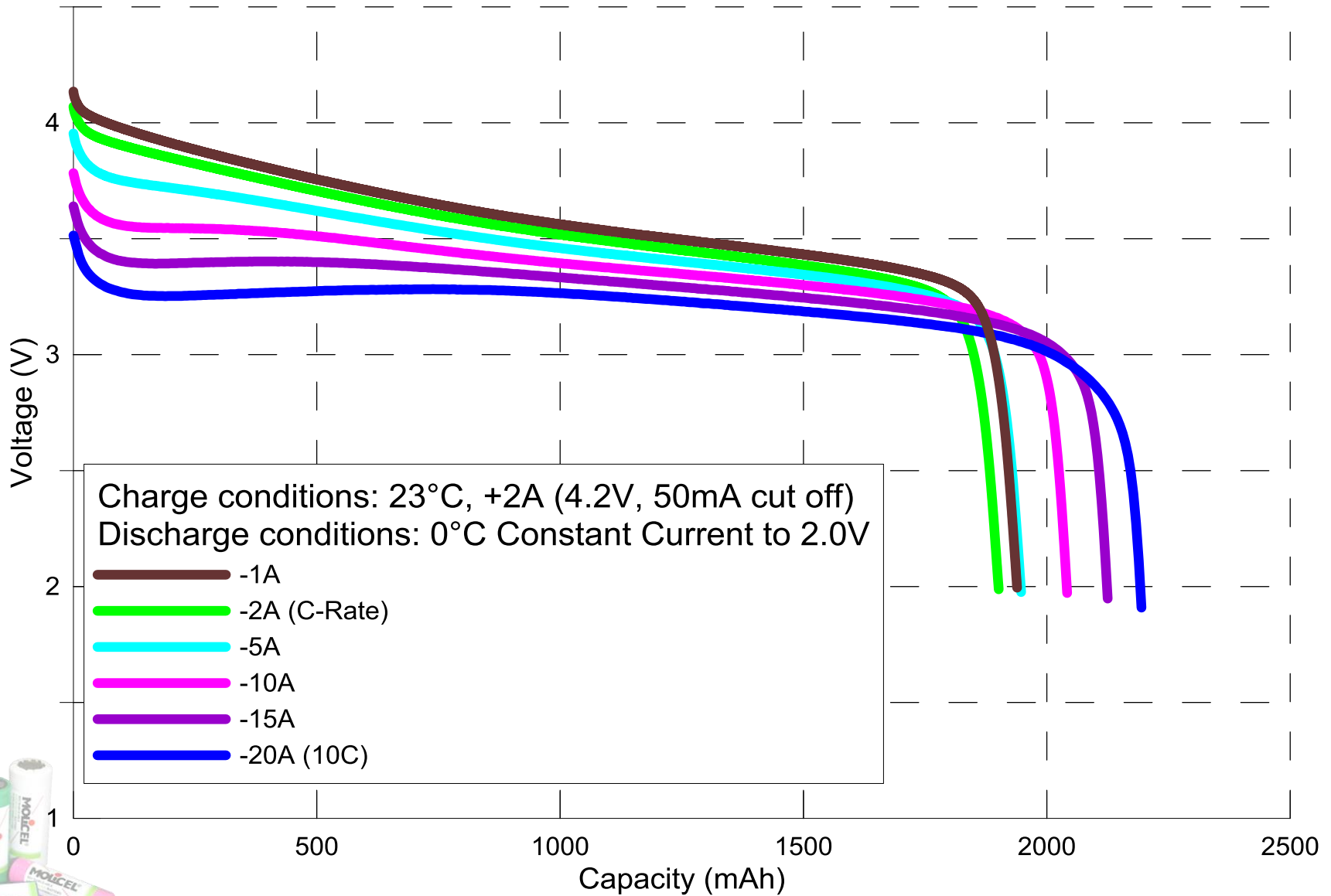
IHR 18650C: 23°C Charge Rate Cycle Life



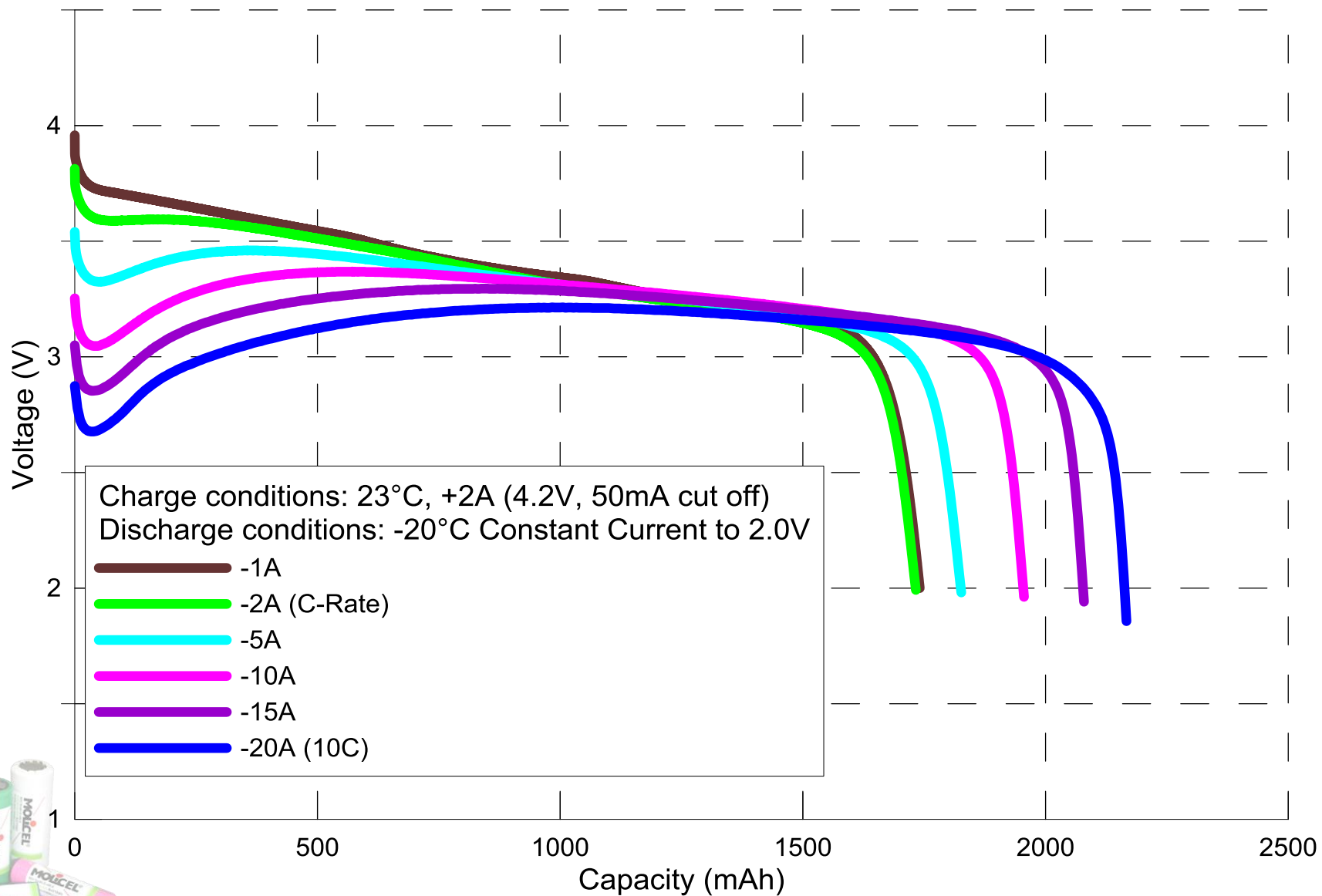
45 °C Rate Map



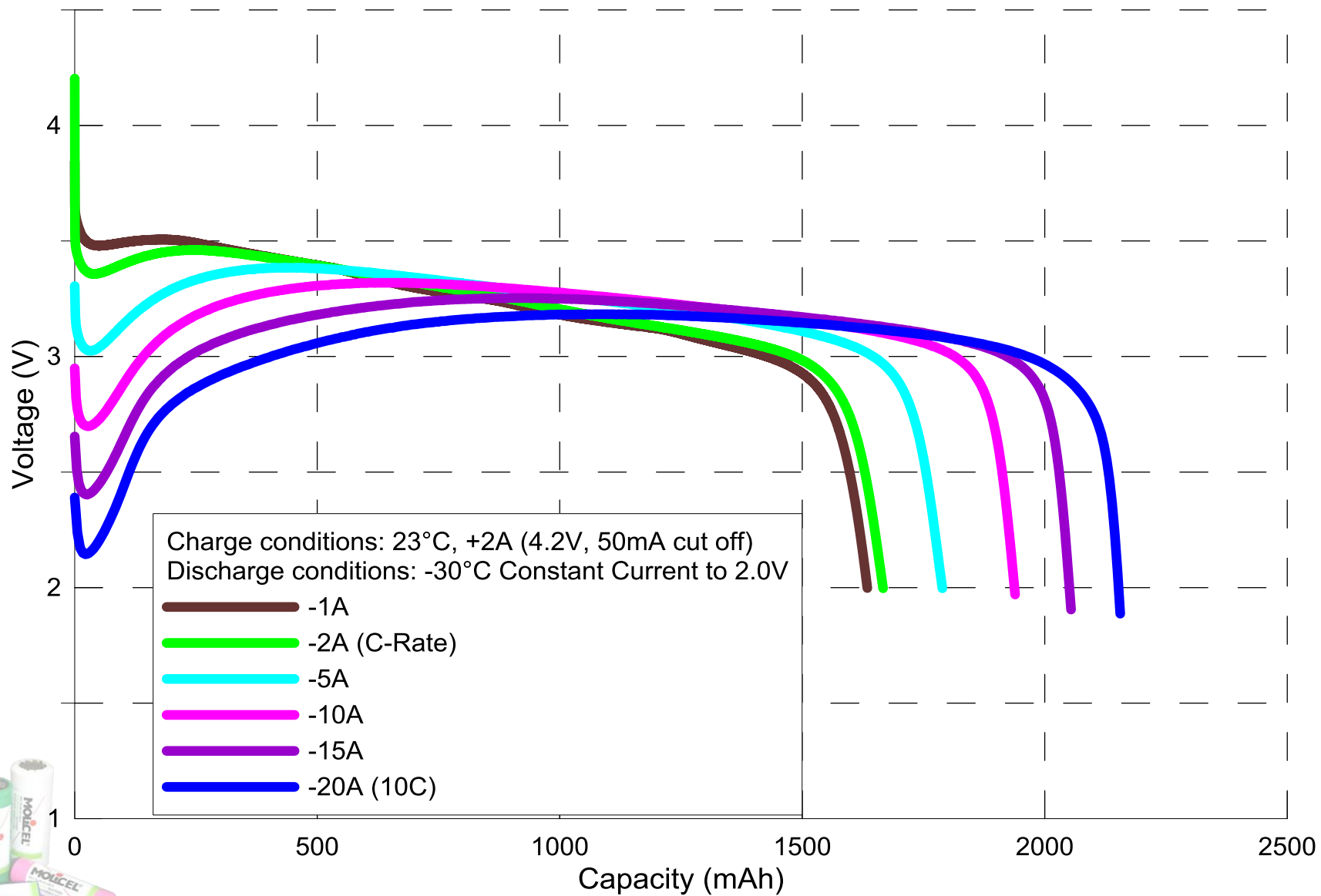
0°C Rate Map



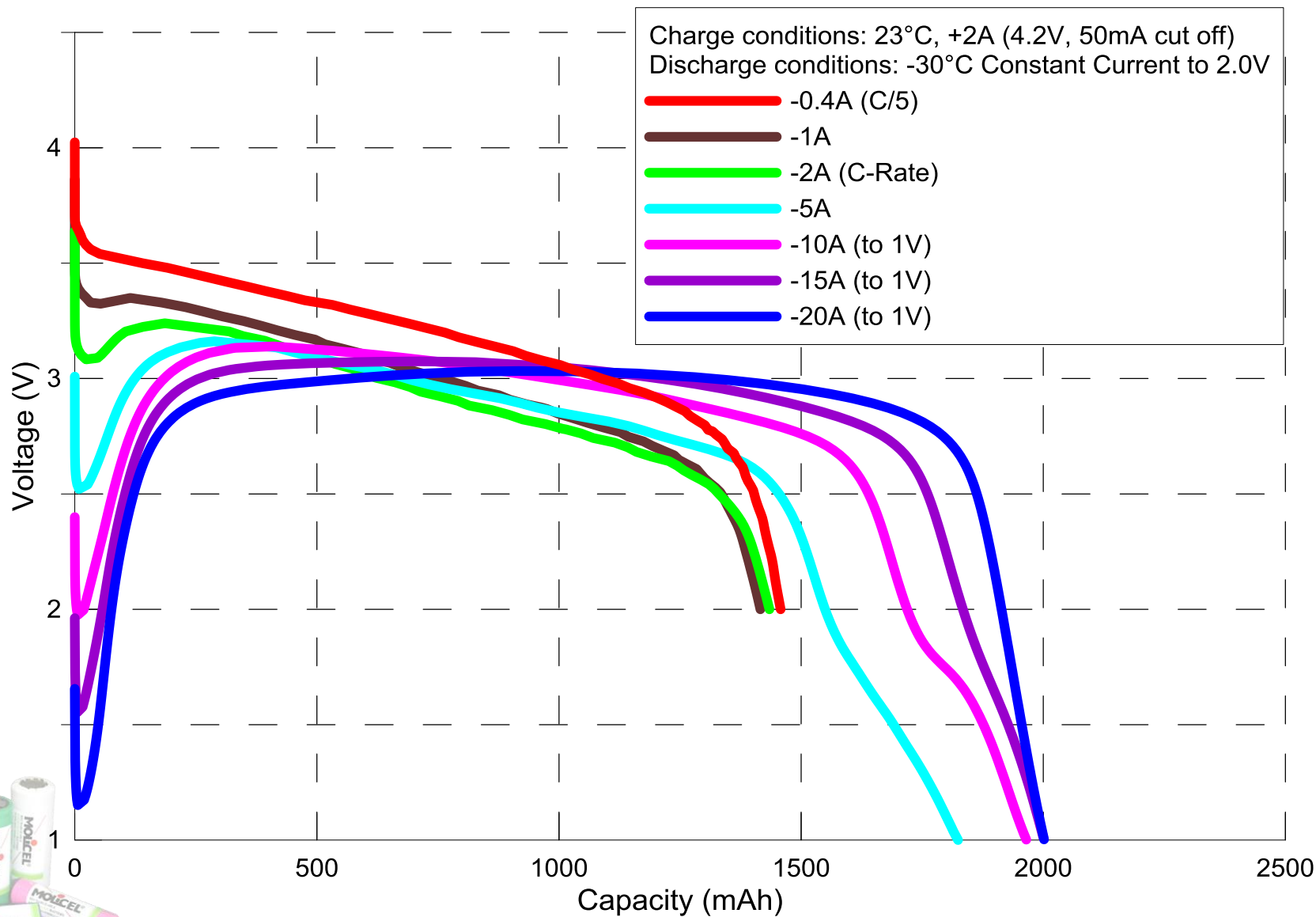
-20°C Rate Map



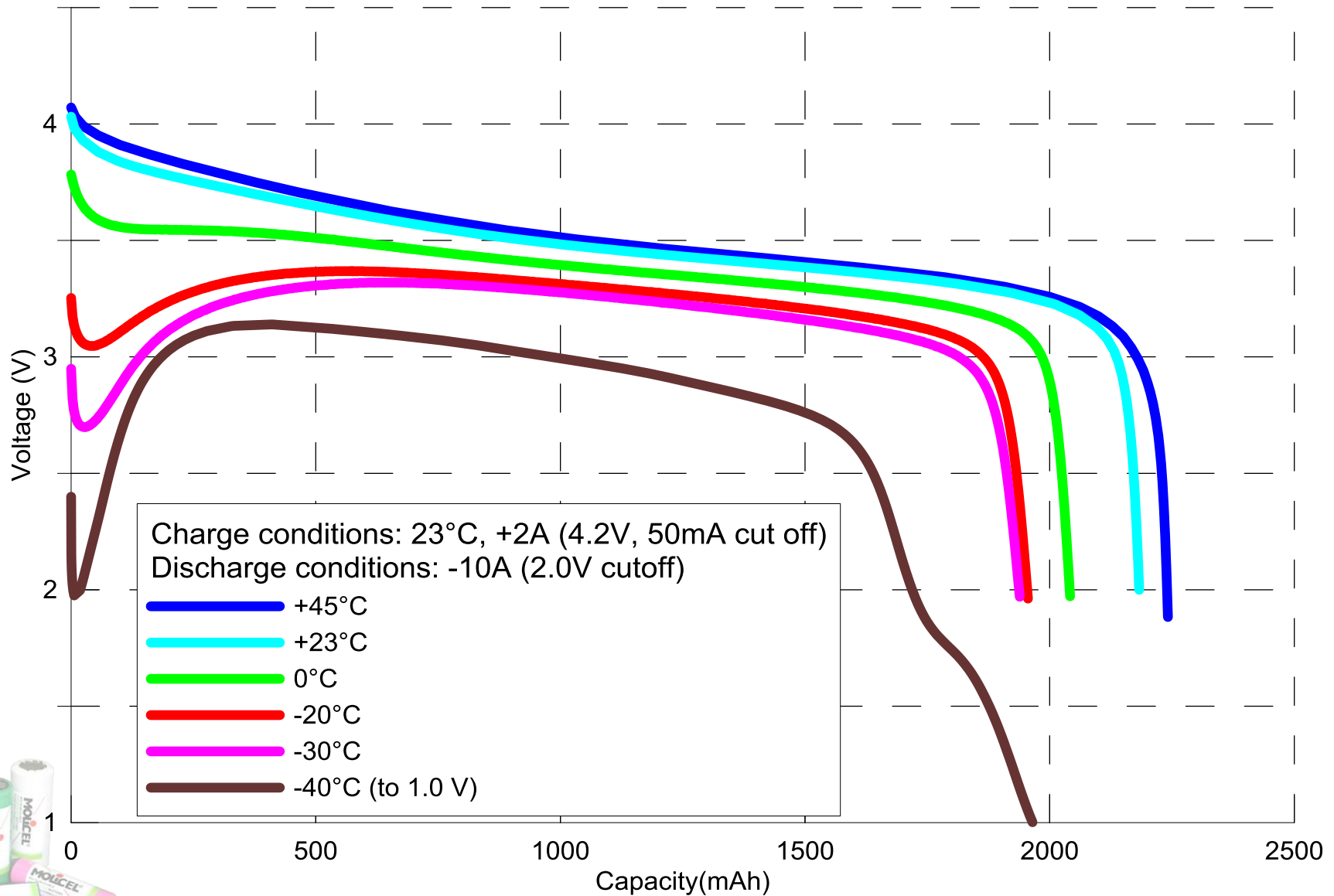
-30 °C Rate Map



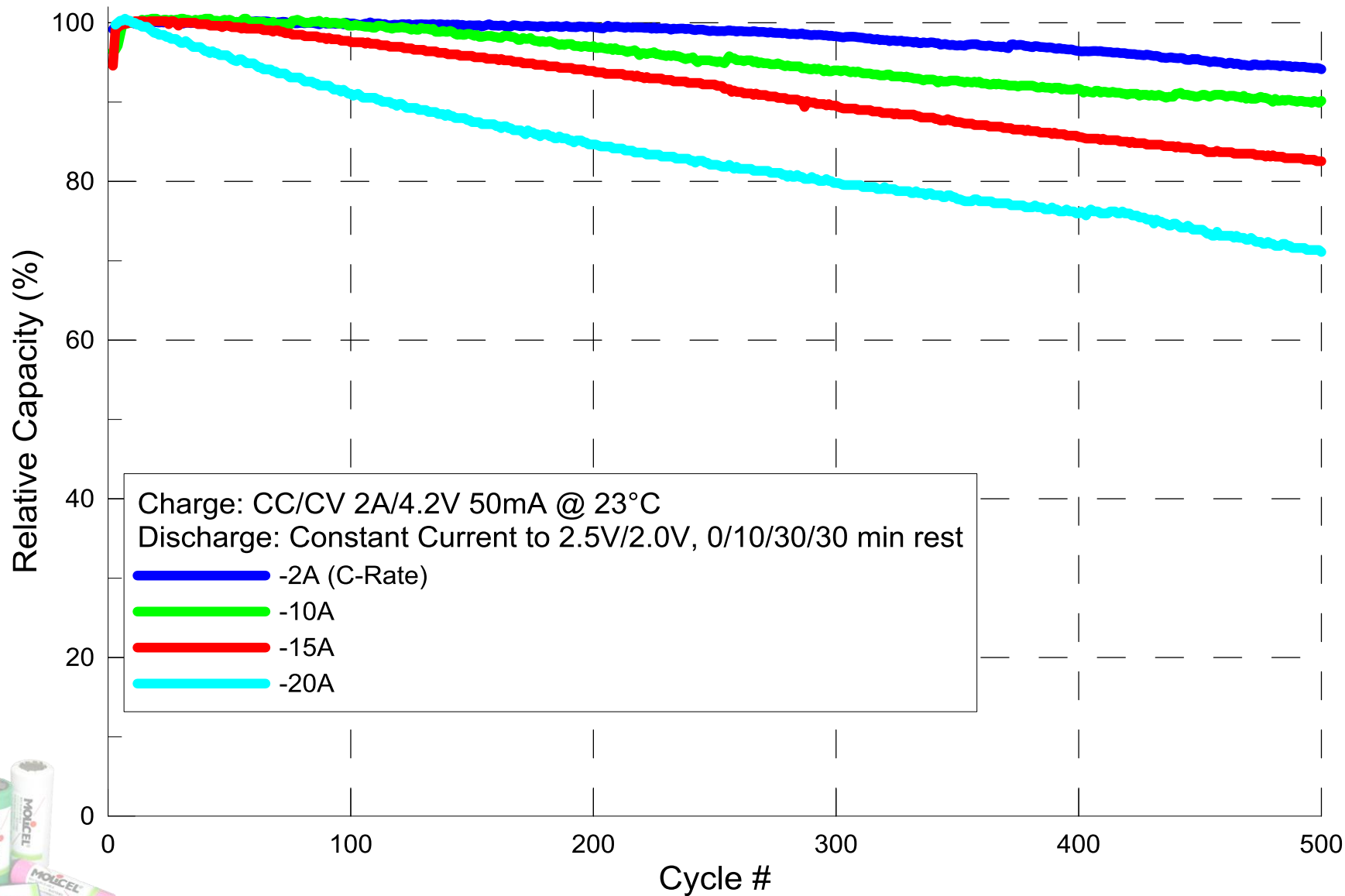
-40 °C Rate Map



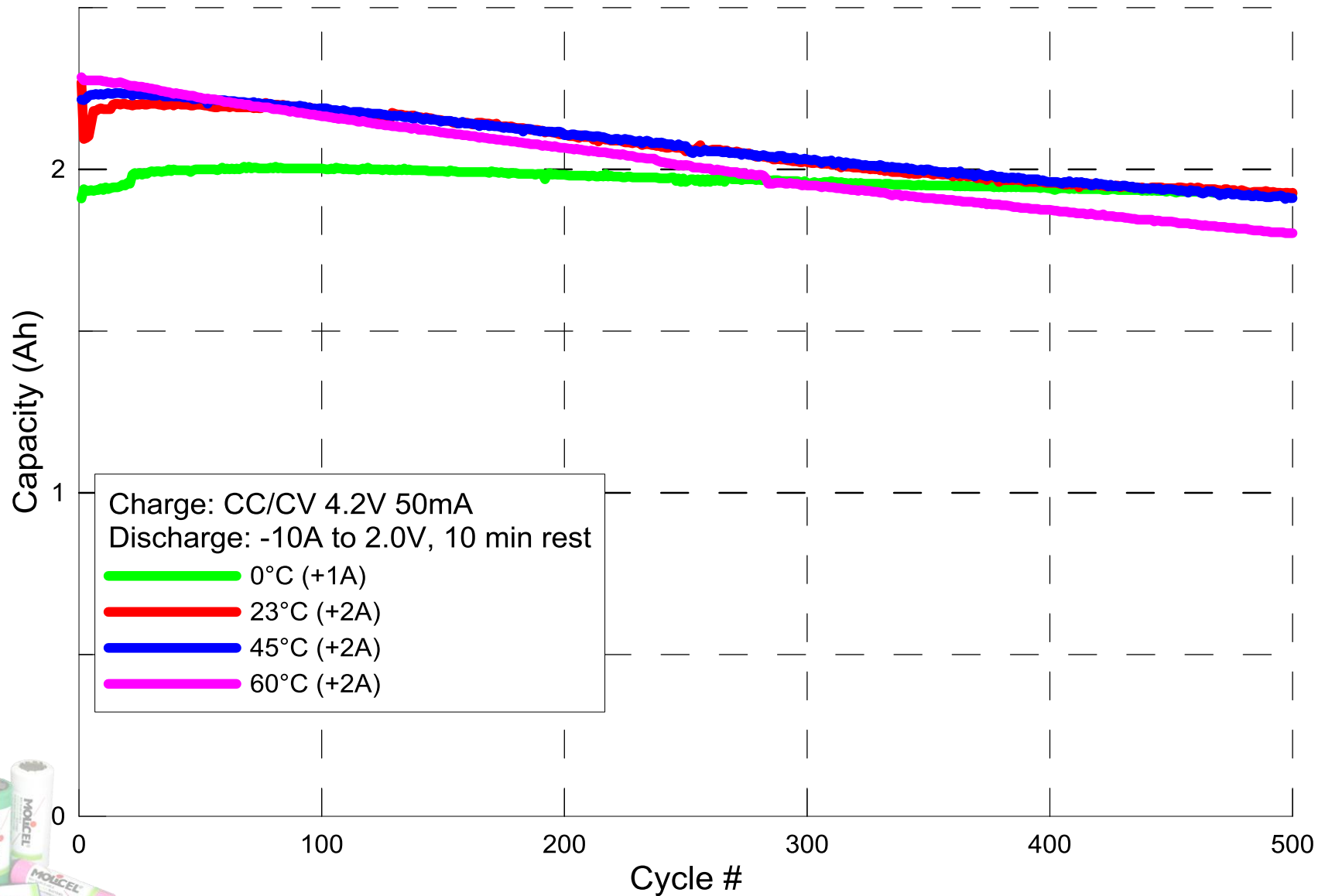
IHR 18650C: 10A Discharge vs Temperature



23 °C Cycle Life vs Discharge Rate



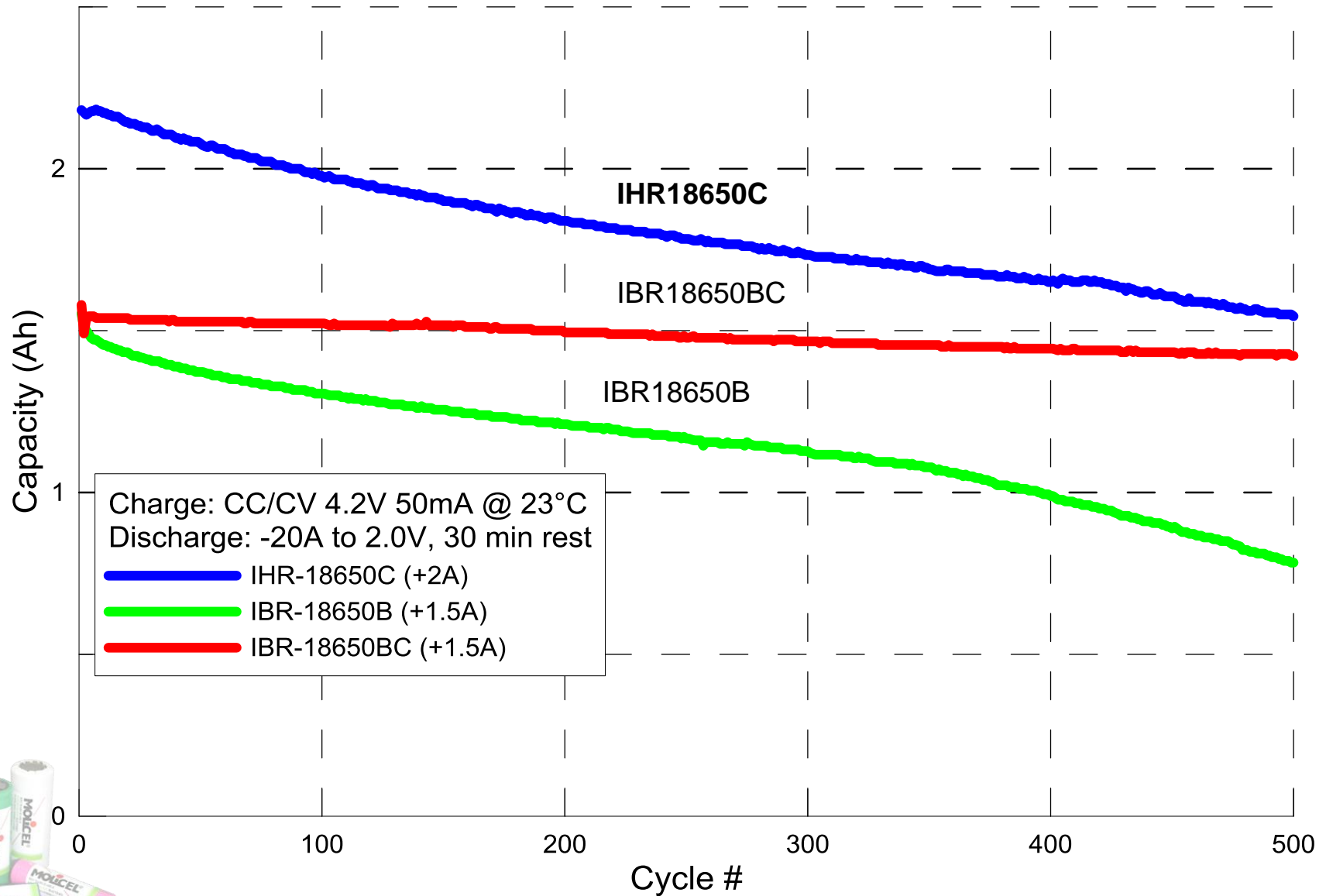
10A Discharge Cycle Life vs Temperature



Cycle #



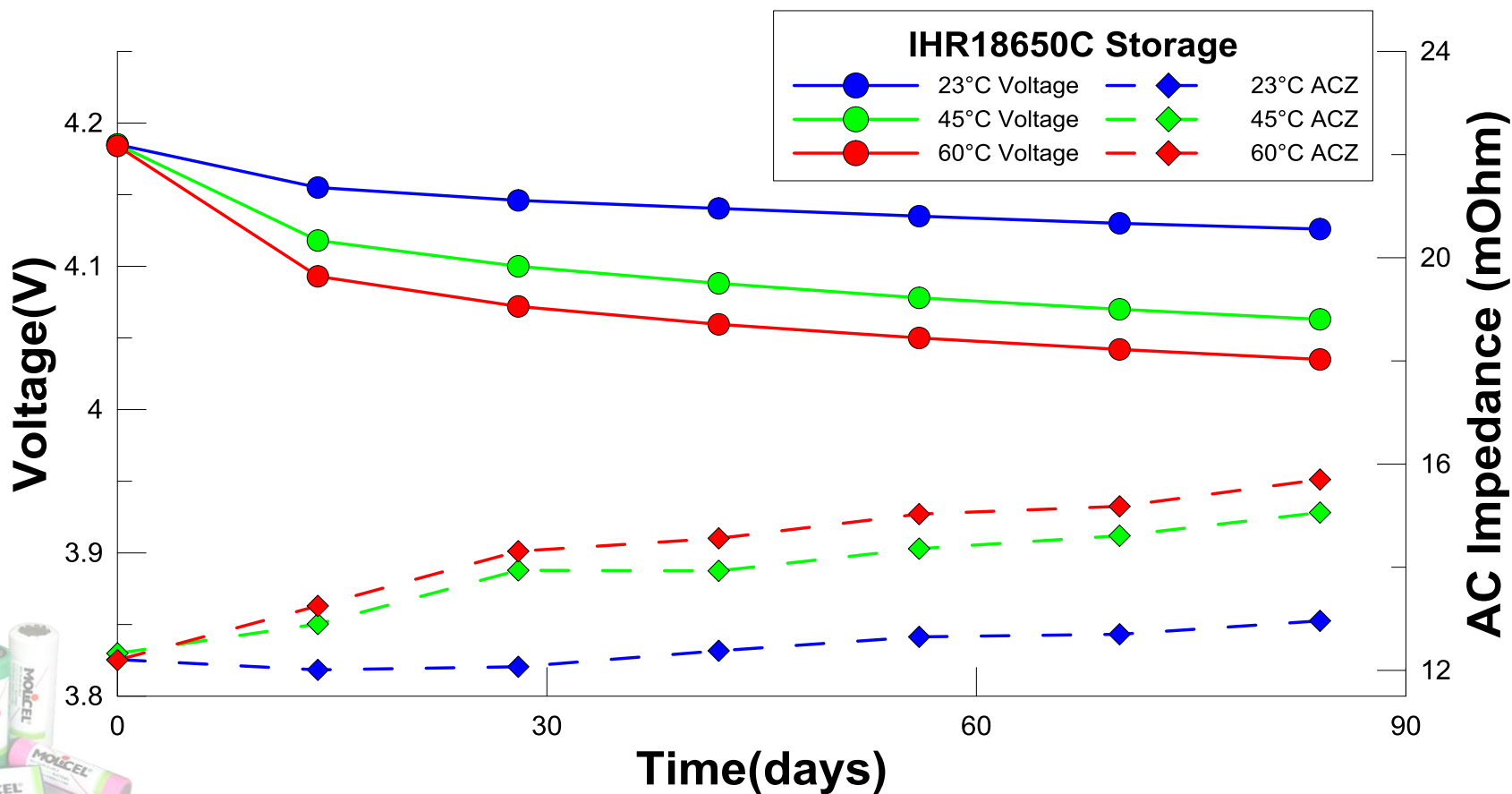
20A Discharge Cycling Comparison



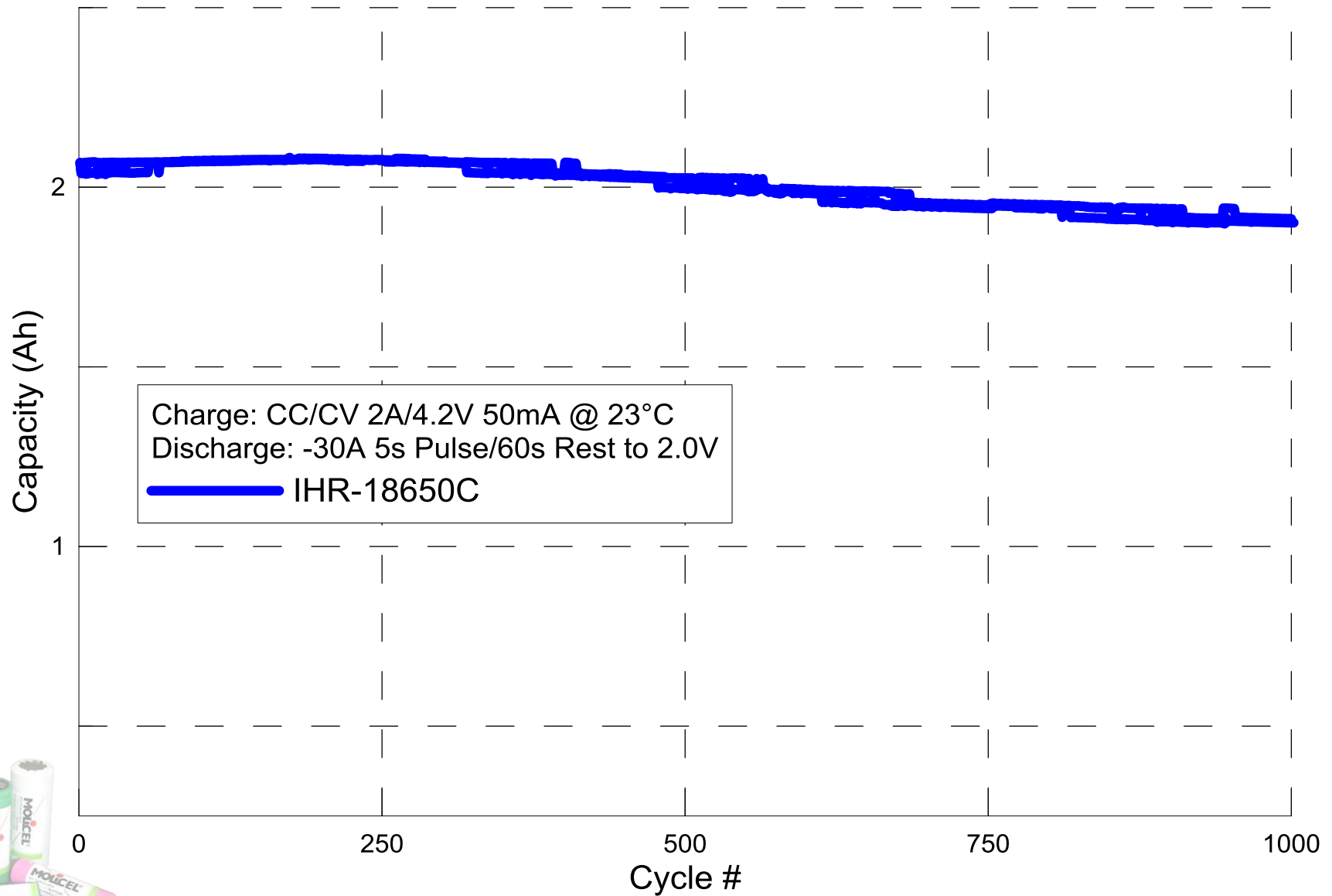
0% DOD Storage

60° C/28 Day Storage

| Design | DOD (%) | Capacity | | ACZ (mOhm) | | |
|-----------|---------|--------------|---------------|---------------|--------------|------------|
| | | Retained (%) | Recovered (%) | Before (mOhm) | After (mOhm) | Change (%) |
| IHR18650C | 0 | 93 | 101 | 12.1 | 14.0 | 16 |



Pulse Testing Cycle Life

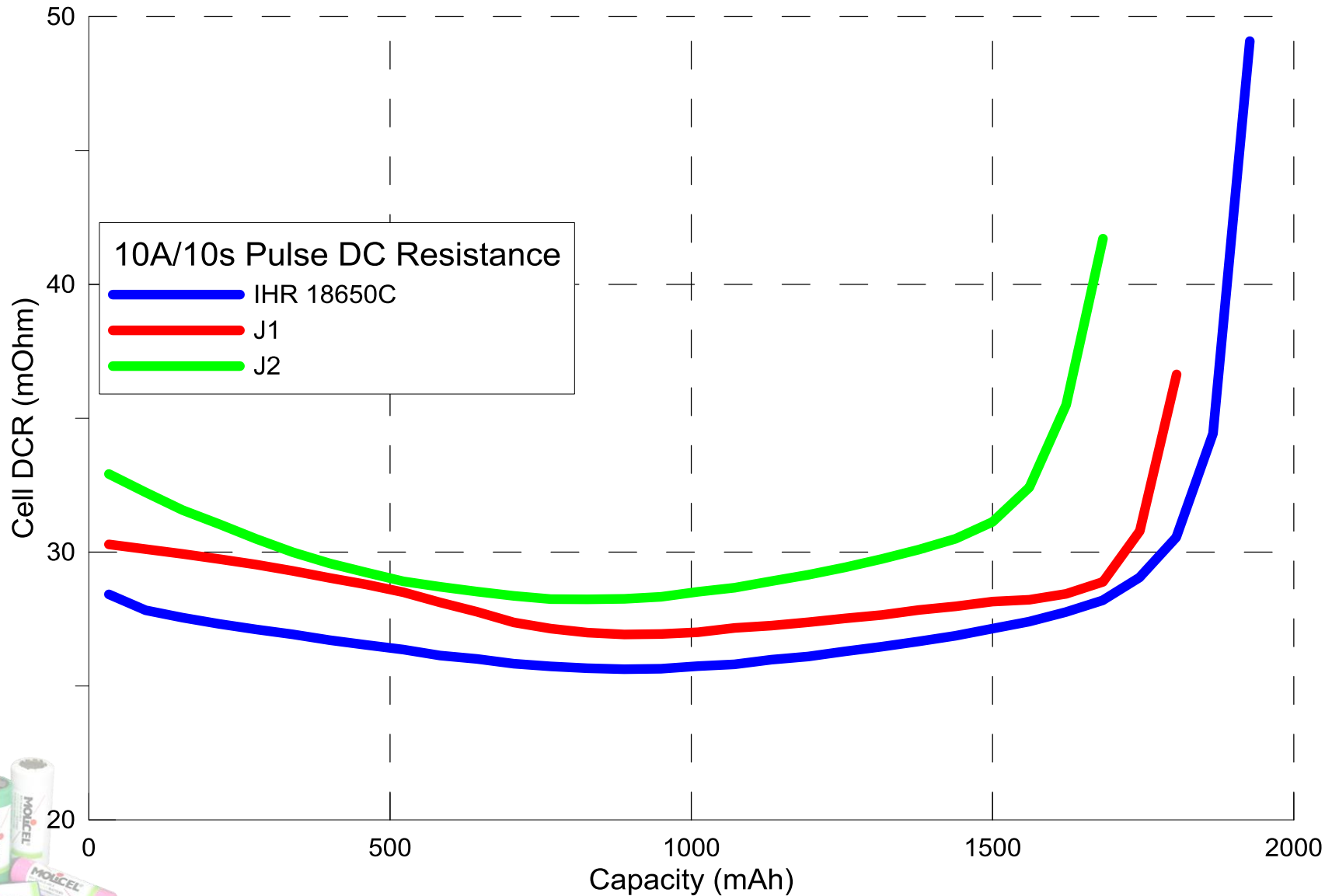


Safety Data

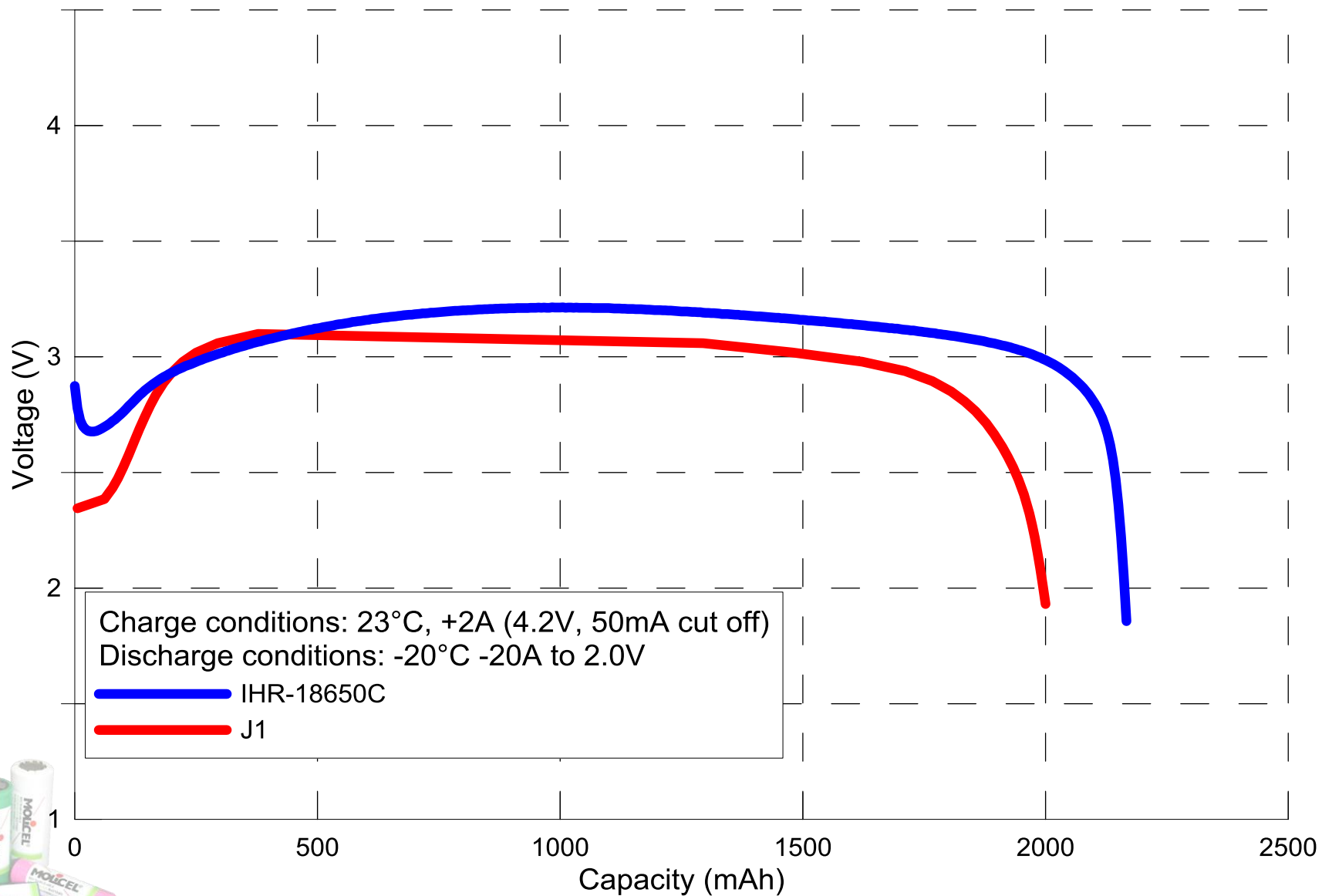
| Test | Condition | Result | Max Temperature |
|---------------------------------|----------------------|--------|-----------------|
| Hotbox | 4.2V, 150 °C | Pass | 156 °C |
| Overcharge 23 °C 100% DOD | 2A,34 V, Insulated | Pass | 50 °C |
| | 4A,15 V, Insulated | Pass | 64 °C |
| | 18A, 15V | Pass | 120 °C |
| Flat Plate Crush | 4.2V, 23 °C 13 kN | Pass | 71 °C |
| Impact | 4.2V, 23 °C | Pass | 117 °C |
| Incineration | 4.2V | Pass | N/A |



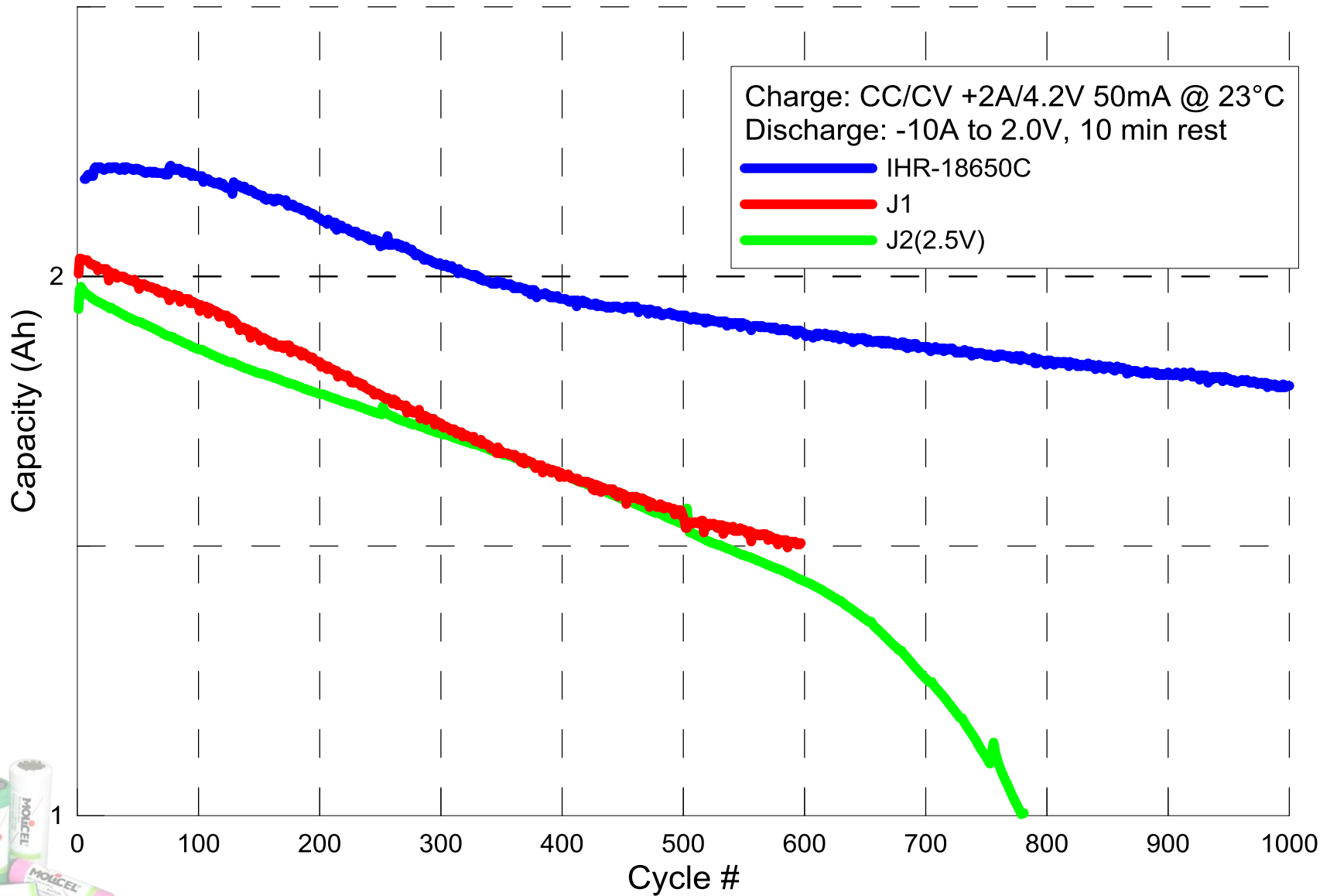
Benchmarking: DC Resistance



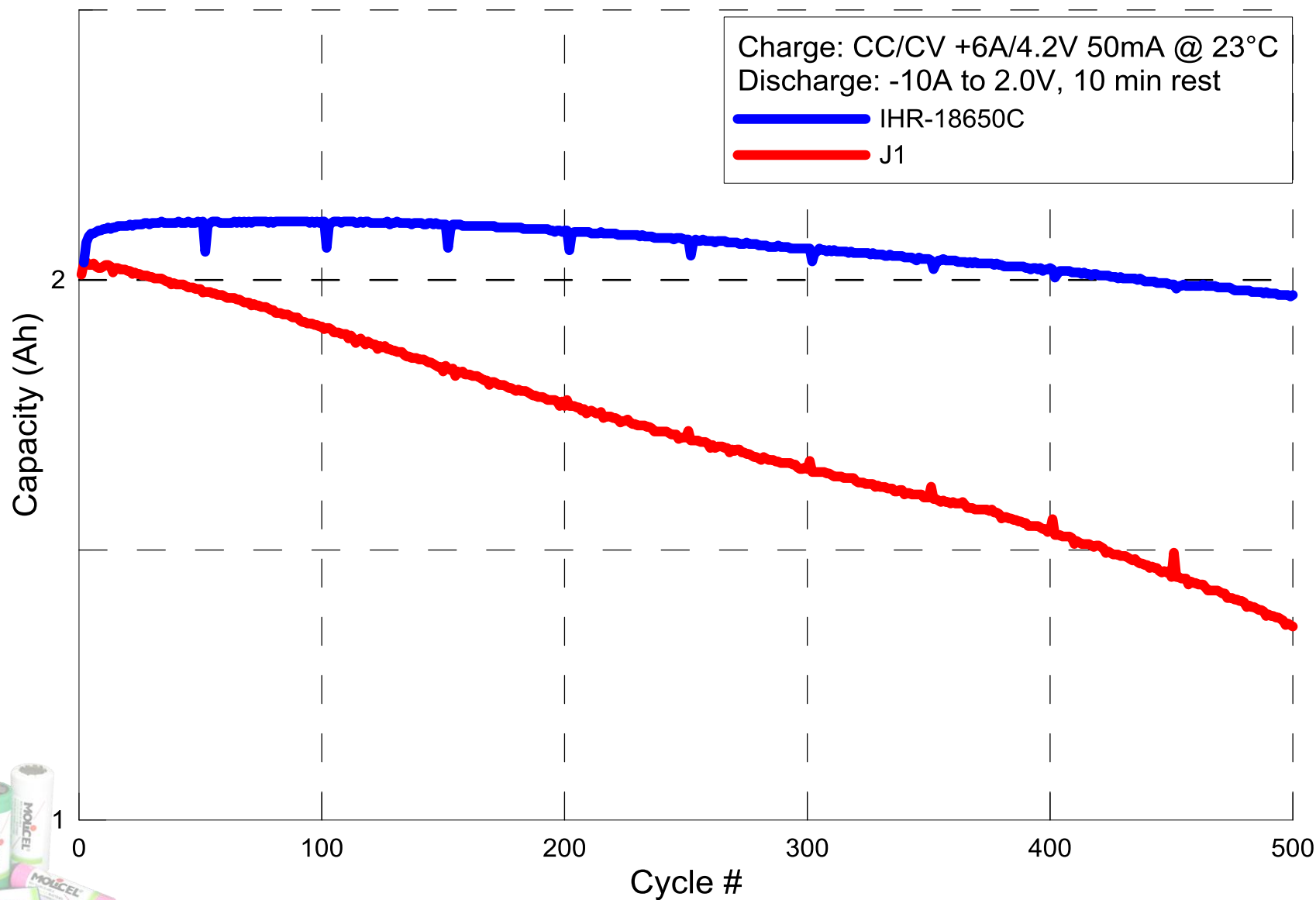
Benchmarking: -20°C, -20A Discharge



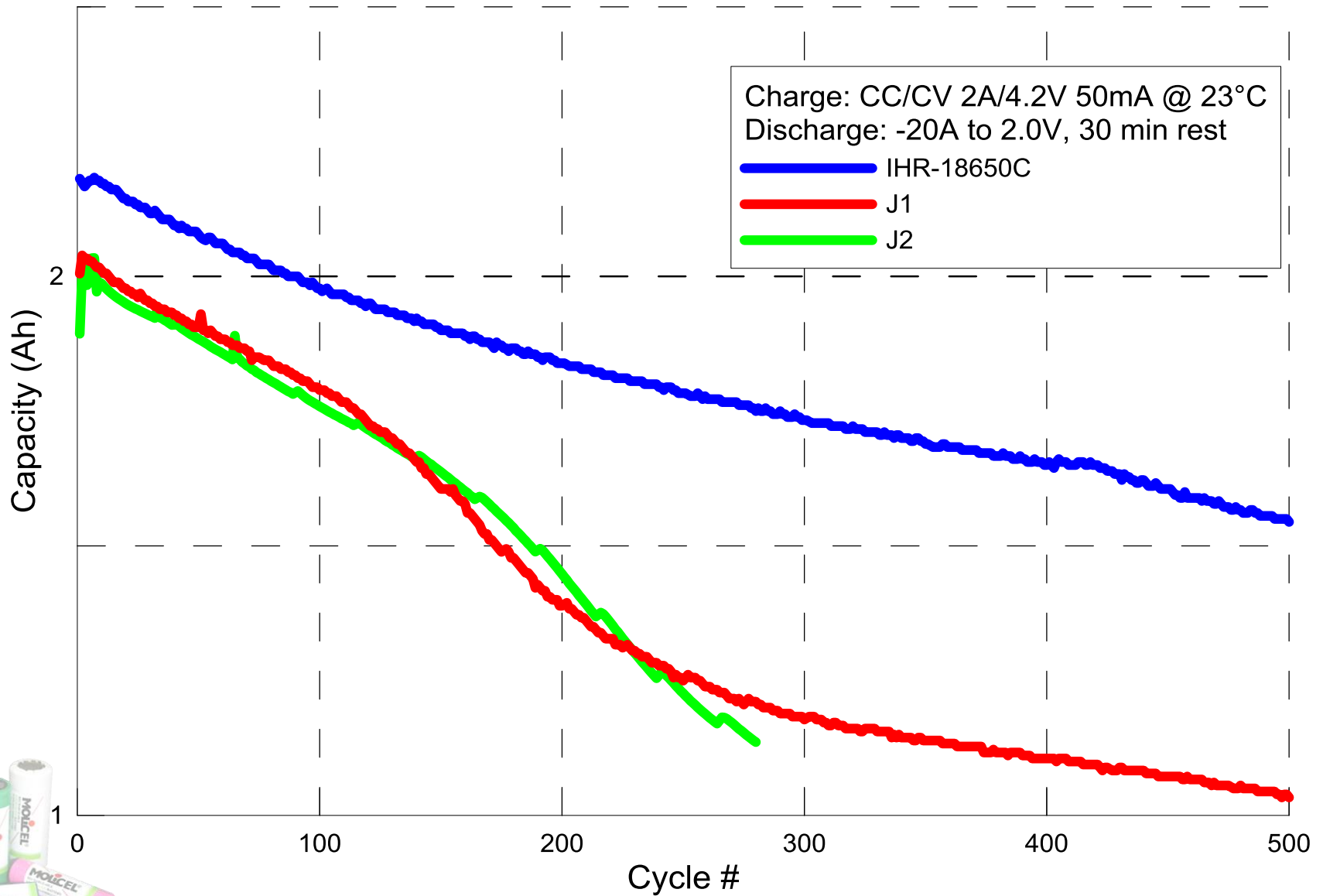
Benchmarking: +2A/-10A Cycling



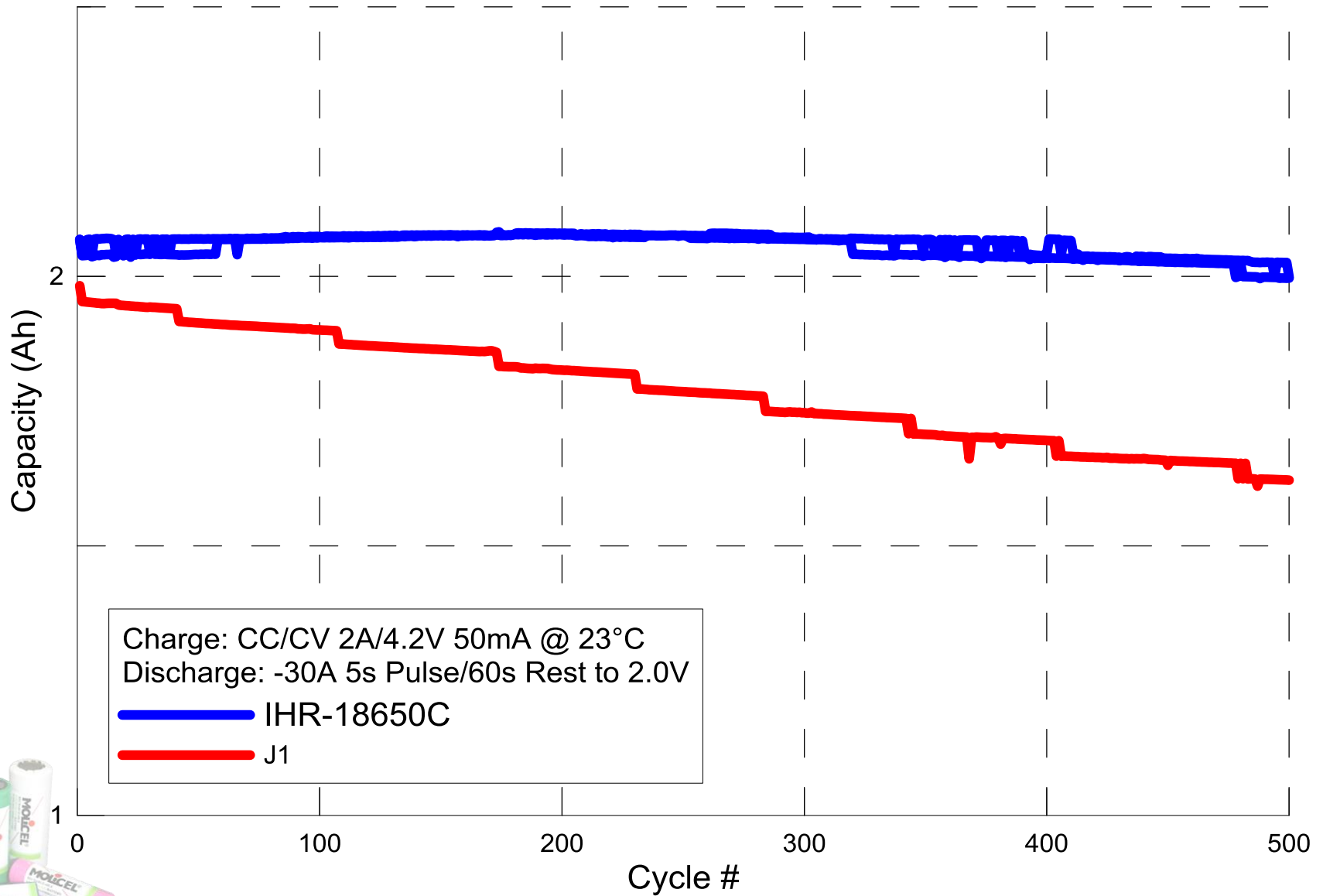
Benchmarking: +6A/-10A Cycling



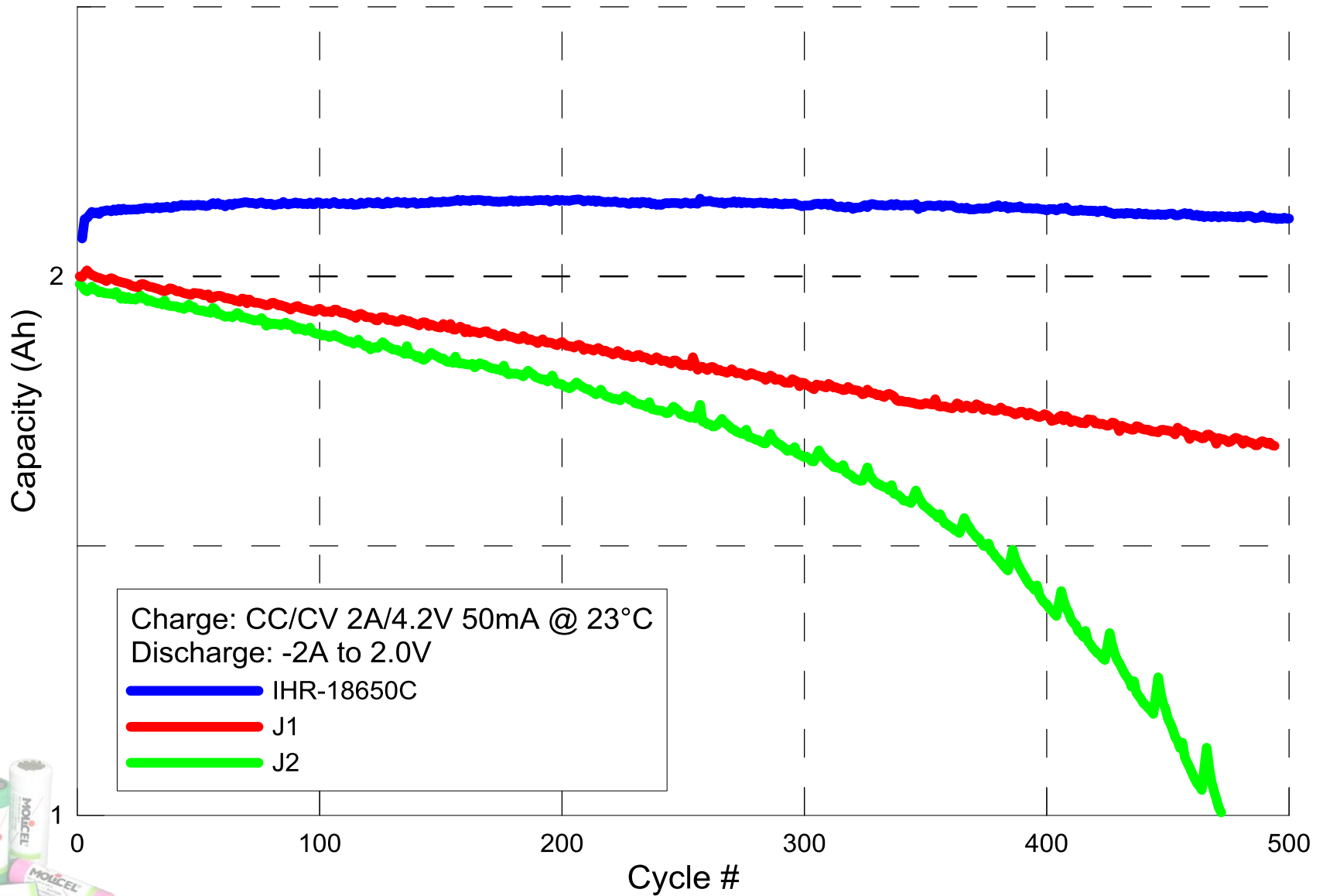
Benchmarking: -20A Cycling



Benchmarking: -30A Pulse Cycling



Benchmarking: C-rate (-2A) Cycling



Thank you for your attention

