

## PARTICLE SIZE ANALYSIS OF LITHIUM ION BATTERY MATERIAL

### Introduction

Battery technology is improving, keeping up with the demand for more portable devices and the desire for better power storage for longer periods between charging and changing batteries. Improved performance requires greater control of the materials used and their physical properties including the particle size distribution.

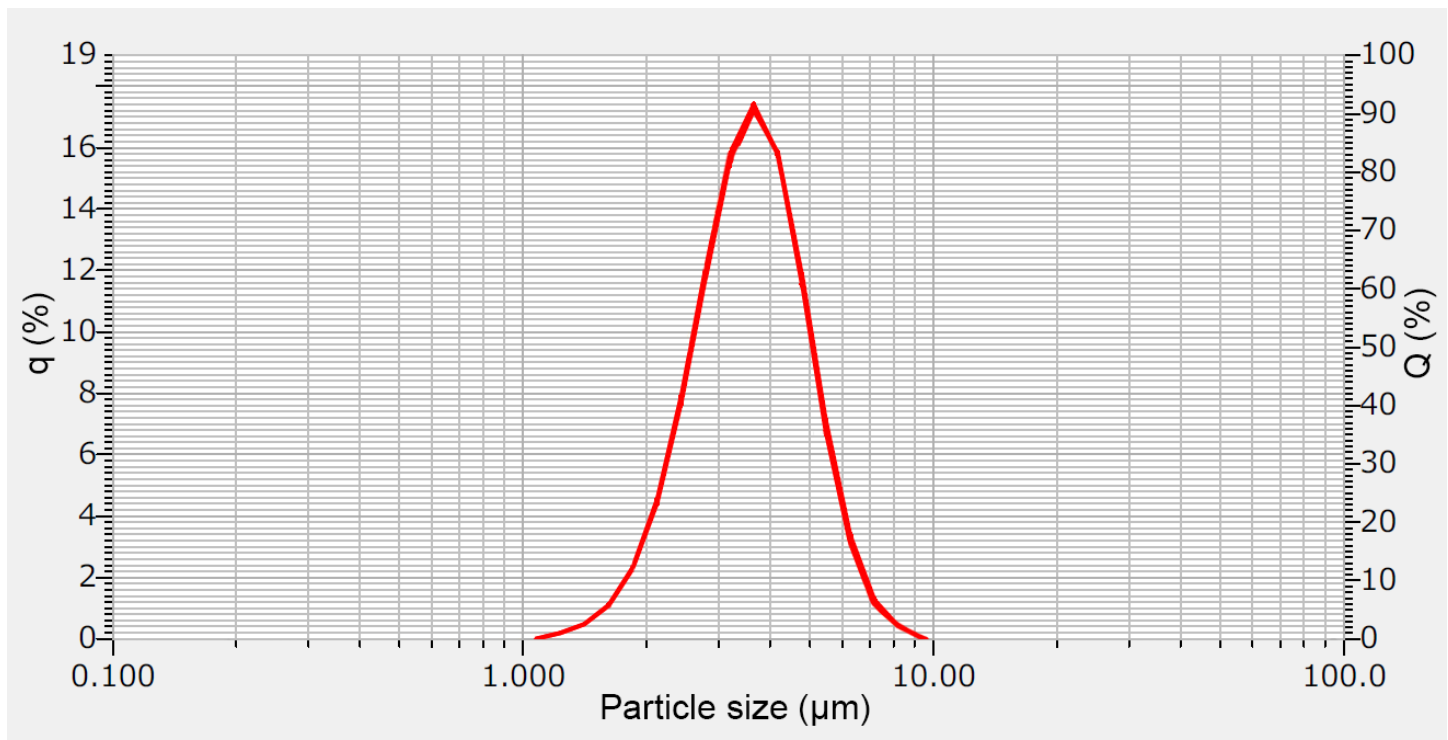
The particle size distribution (PSD) of the materials used to make these batteries is tested in both R&D environments and in QC for product acceptance since a PSD specification typically exists for the material. Particle size influences both capacity and coulombic efficiency. Reducing the PSD will increase the specific surface area, increasing reaction rates, and also changing the size of the voids between electrode particles, which can reduce battery capacity. Thus, tracking PSD during battery development and manufacture is important to optimizing performance.

### Analytical Test Method

|                     |                                  |
|---------------------|----------------------------------|
| Technique:          | Laser Diffraction                |
| Instrument:         | HORIBA LA-960                    |
| Cell:               | High Concentration Cell          |
| Diluent:            | NMP with PVDF                    |
| Dilution:           | 20x                              |
| Cell type:          | High concentration sampling cell |
| Blue transmittance: | 20-40%                           |
| Spacer thickness:   | 25 micron                        |

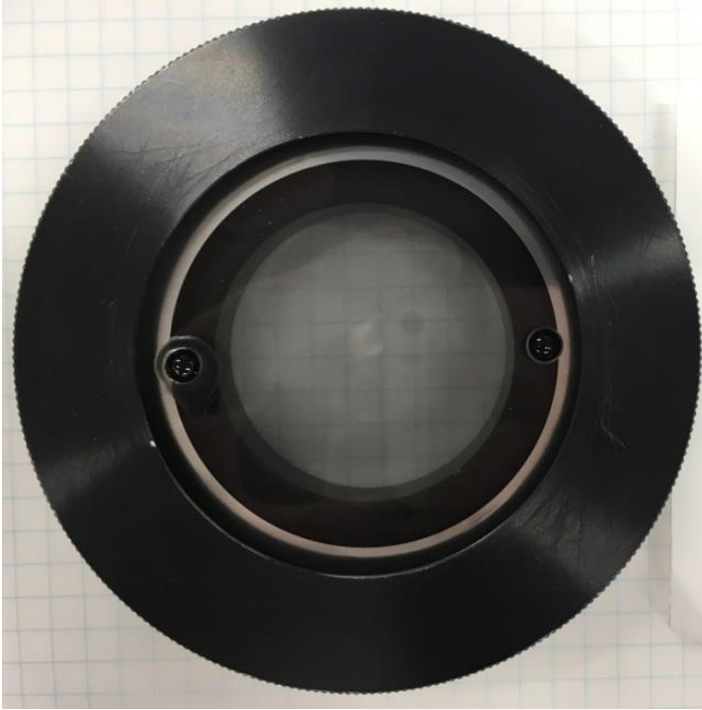
### Results

|         |                    |
|---------|--------------------|
| Median: | 3.60 $\mu\text{m}$ |
| Mode:   | 3.65 $\mu\text{m}$ |
| Mean:   | 3.74 $\mu\text{m}$ |



The sample is shown in the high concentration cell before analysis in the LA-960. Note that by using a thin spacer, the sample is almost clear and the graph paper is visible through the sample. In this way, even thick samples can be reliably analyzed.

20x Dilution



## Conclusion

The LA-960 is highly capable of measuring lithium ion battery material. It does not require large amounts of dilution, so particle size measurements remain reliable and accurate.