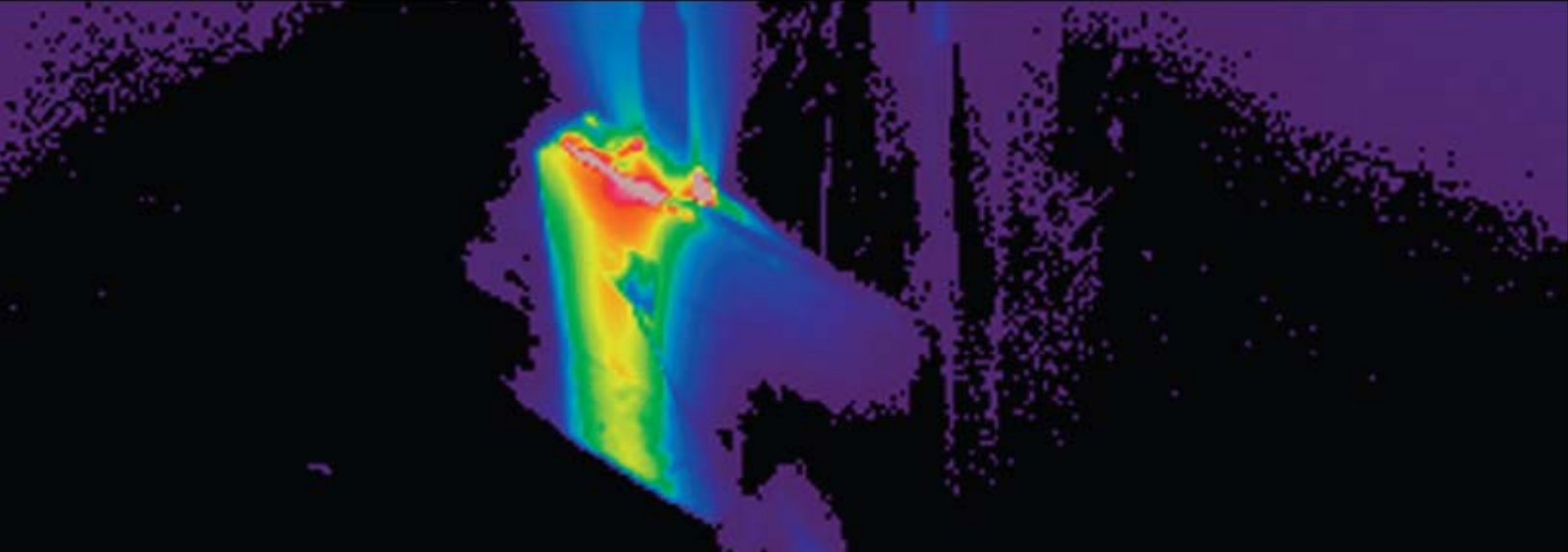




Exponent[®] Battery Services

Exponent is a leading engineering and scientific consulting firm specializing in the investigation, analysis and prevention of accidents and failures. We provide a broad range of independent third party consulting services for the battery industry, including:

- Battery Pack Incident Investigation
- Manufacturing Quality Auditing
- Product Recall Support
- Regulatory Compliance Testing
- Environmental Stress and Reliability Testing
- Charging System, Battery Pack and Cell Safety, Design, and Performance Evaluation
- CTIA Certification

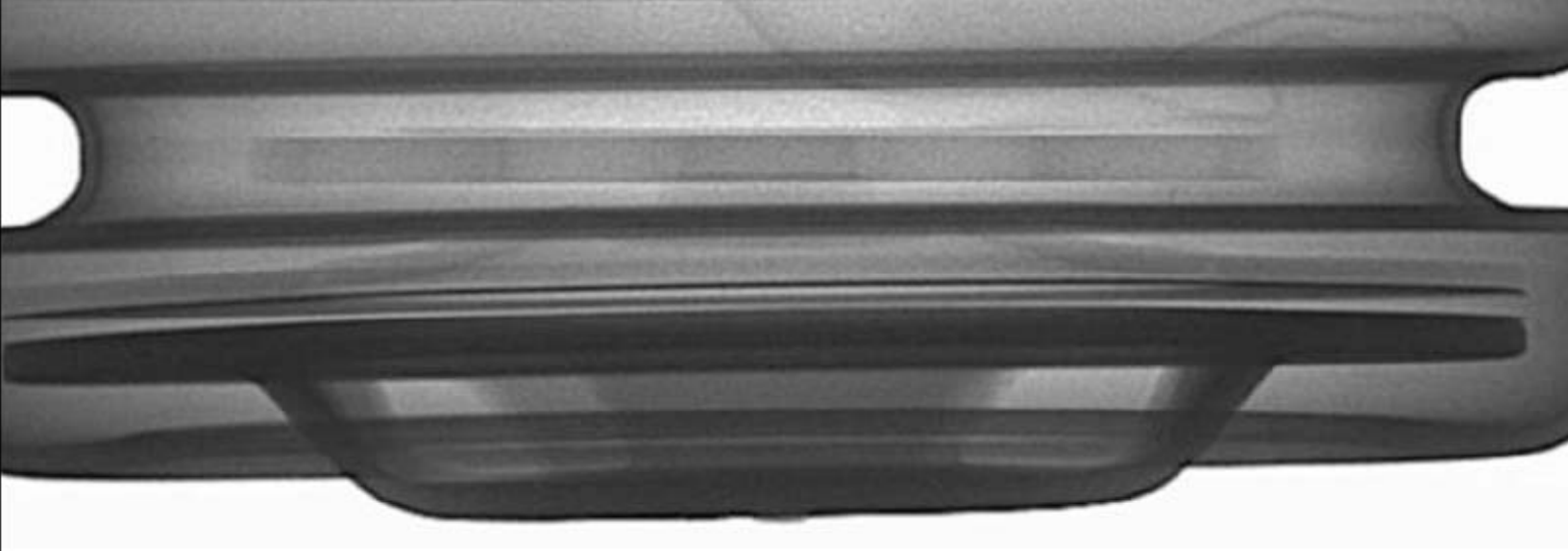


Customized Testing for Specific Safety Concerns

Standard tests are not intended to encompass all reasonably foreseeable use and abuse conditions or failure modes. Exponent designs and conducts customized tests on cells and battery packs that can address specific safety concerns or special customer needs. Examples of such testing include:

- FAA Style Fire Box /Halon Suppression Tests
- Thermal Runaway Characterization as Function of State-Of-Charge
- Battery Pack Torsion and Bending Tests
- Battery Pack Deformation and Penetration Test
- “Super Drop” Test to Assess Result of Severe Mechanical Impact
- Liquid Intrusion Test
- Cell-In-Pack Programming Test
- Protection Circuit Board Fault Replication
- Partial Stack Short Testing





Product Recall Support

Exponent has helped many customers:

- Determine whether a product failure mode constitutes an unreasonable risk for injury to a consumer
- Determine the extent of production lots affected by a manufacturing defect that could result in a hazardous failure mode
- Independent review of vendor data and failure analyses work
- Work with a third party vendor to resolve manufacturing defect problems
- Calculate expected failure rates and predict risk
- Statistical correlation of manufacturing data to field failure data
- Present findings to the US Consumer Products Safety Commission

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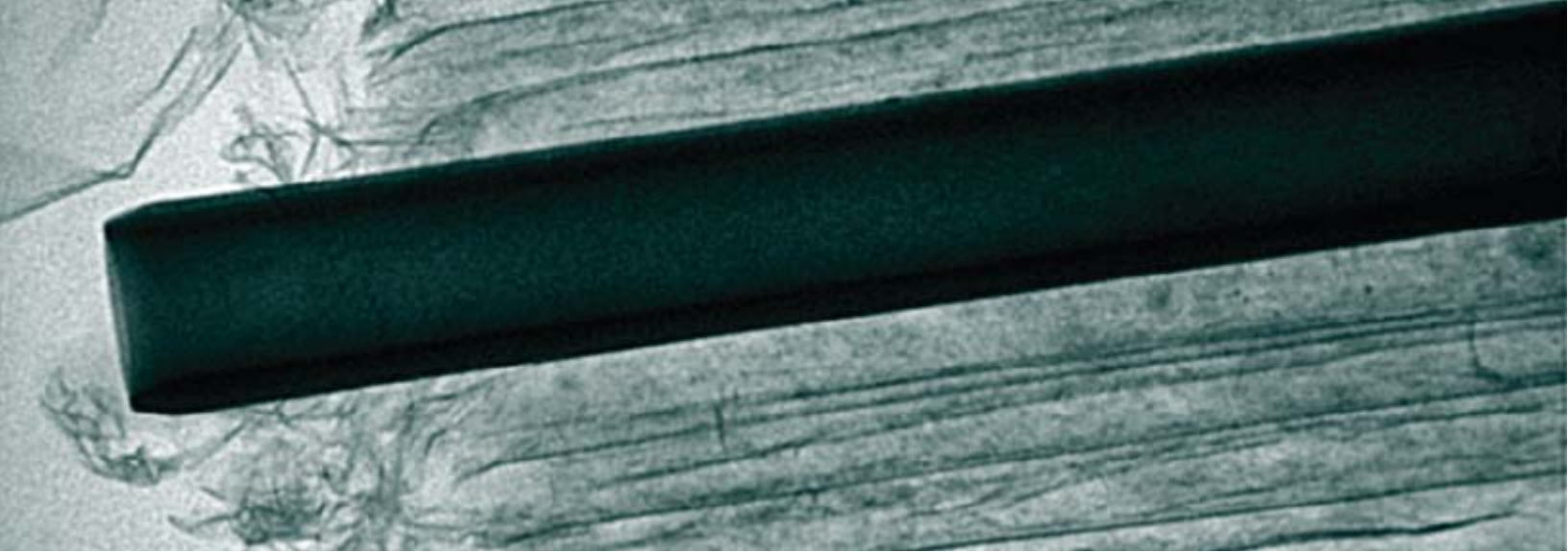
Process and Quality Auditing of Battery and Pack Manufacturers

Improve Safety & Reliability • Optimize Process • Minimize Reject Rates

Typical areas examined during audits:

- Research and Development
- Failure Modes and Effects Analyses(FMEA)
- Incoming Material Storage and Handling
- Incoming Quality Control (IQC)
- Sources of Contamination
- Material and Component Handling
- Equipment Operation
- Real-Time Process Monitoring and Quality Assurance
- Quality Control, Safety and Reliability Testing Techniques
- Statistical Process Control
- Process Documentation
- Standard Operation Procedures(SOP) and Worker Instructions

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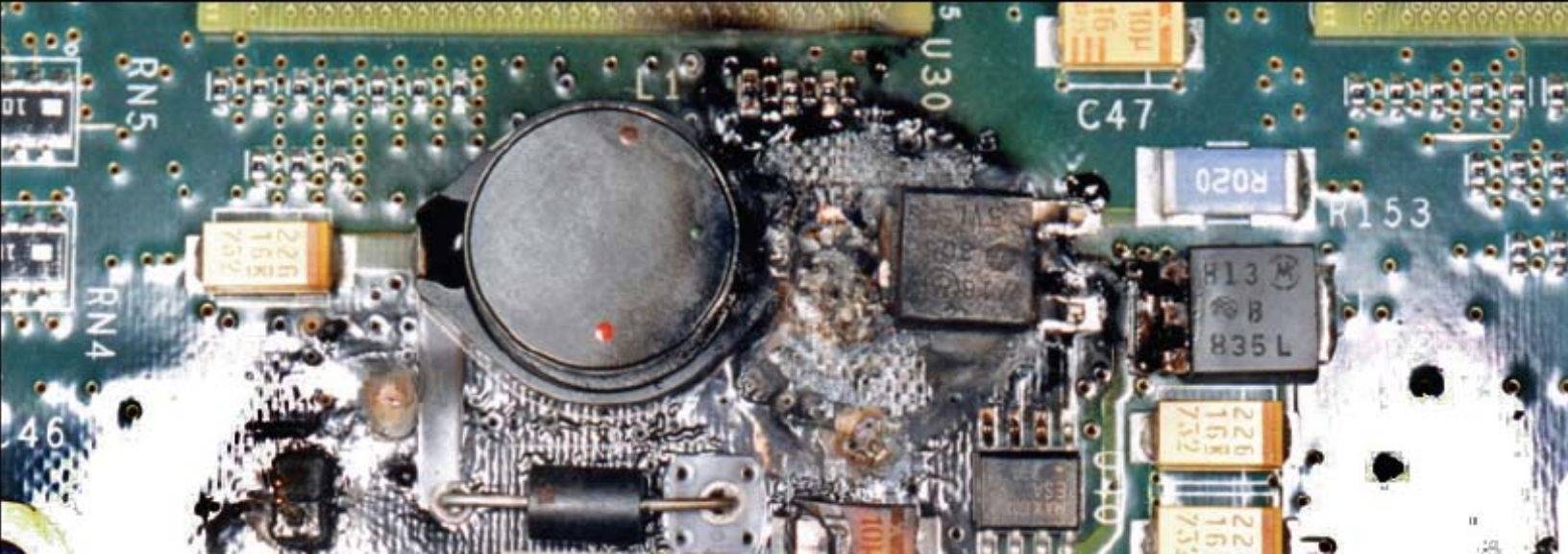
Battery Pack Incident Investigation

When a battery fails in a manner that results in electrical malfunction, thermal damage, case rupture, or combustion, a number of questions typically arise:

- Was the failure induced by external forces, such as severe mechanical damage or excessive heat exposure?
- Was the failure the result of cell, protection circuitry, or pack design?
- Was the failure the result of an internal cell fault or a pack manufacturing flaw that was not detected by the quality control procedures put in place by the manufacturer?
- Does the failure represent a random occurrence or is it an early sign of a developing trend?
- If a product cell is warranted, which manufacturing lots should be recalled?

Differentiating between the potential causes of any failure can be difficult, particularly when the failed product or system has been heavily damaged. Based on numerous lithium-ion battery failure analysis investigations, Exponent has developed a systematic investigation approach that has proven effective in identifying the particular causes of any given failure and developing recommendations for corrective action as appropriate.





Customized System Level Safety Evaluation

Exponent has many years of experience in failure analysis and safety performance evaluations of computer power supplies, battery technologies, chargers, and power adapters. Exponent can assist clients to develop comprehensive and robust test protocols, and to maximize product safety evaluation effectiveness in a rapid product development environment. The following are some typical product performance evaluations:

- Power adapter/charger circuitry review, inspection and analysis
- System integration and normal operation analysis
- Charger/power supply design evaluation
- Charger/power supply safety analysis
- Charger/power supply/battery pack communication analysis
- Charger/power supply analysis and testing under various environmental conditions

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System Level Electrical Failure Analysis & Consulting

- Printed Circuit Board Layout Review
- Printed Circuit Board Propagating Fault Analyses
- Component Failure Analyses
- Electronic Protection Coordination Review
- Electronic Failure Modes and Effects Analyses
- Development of Specialized Measurement Instrumentation
- Electrical System Design Analysis
- Patent Evaluation and Infringement Review
- Technical Due Diligence Reviews

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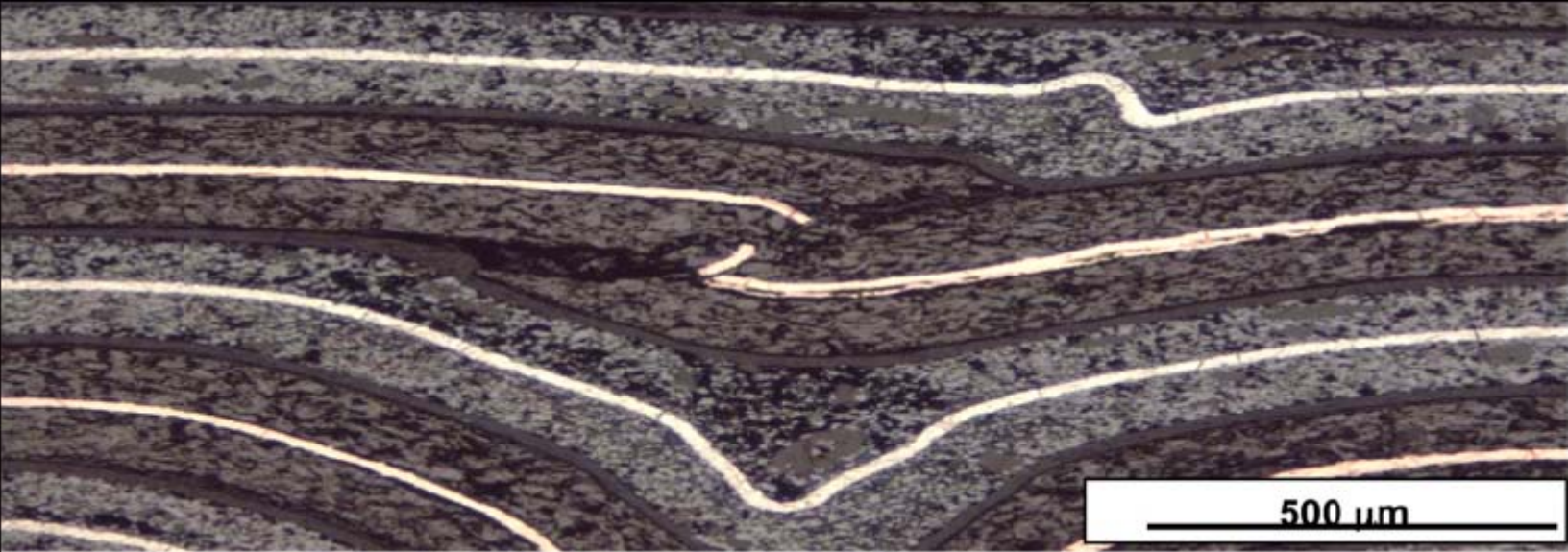


Environmental Stress and Reliability Testing

Exponent has experience monitoring and modeling the performance of computer power supplies, battery technologies, chargers, and power adapters in real time under various environment stress conditions. For example, using IR thermo-graphy, rapid localization and characterization of the temperature conditions inside the battery packs, power supplies, chargers, and host devices can be achieved. Information obtained is then used to develop further performance testing. Exponent routinely performs environment stress and reliability tests in the following general areas:

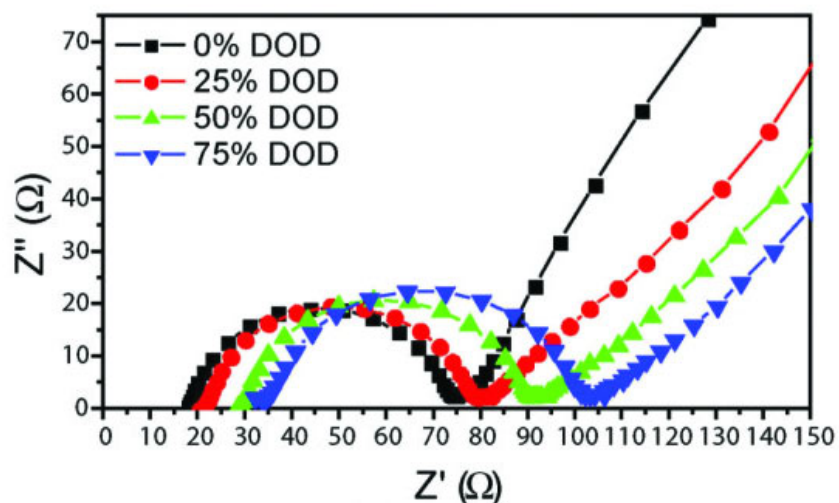
- Temperature Testing
- Pressure Testing
- Electrical Overstress Testing
- Humidity Testing
- Altitude Testing
- Mechanical Testing





Electrochemical and Materials Testing

- Electrochemical evaluation of battery materials
- New technology evaluation and due diligence
- Accelerated lifetime testing
- Customized performance and reliability testing
- Identification and characterization of performance degradation mechanisms



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CTIA Certification

Exponent's Phoenix laboratory was ISO17025 approved in 2007, and the CTIA approved Exponent as a CTIA Authorized Test Laboratory (CATL) in 2008. Exponent has the expertise and ability to provide its client with both consulting and testing services for CTIA battery certification program.

Consulting Services:

CTIA certification consulting -

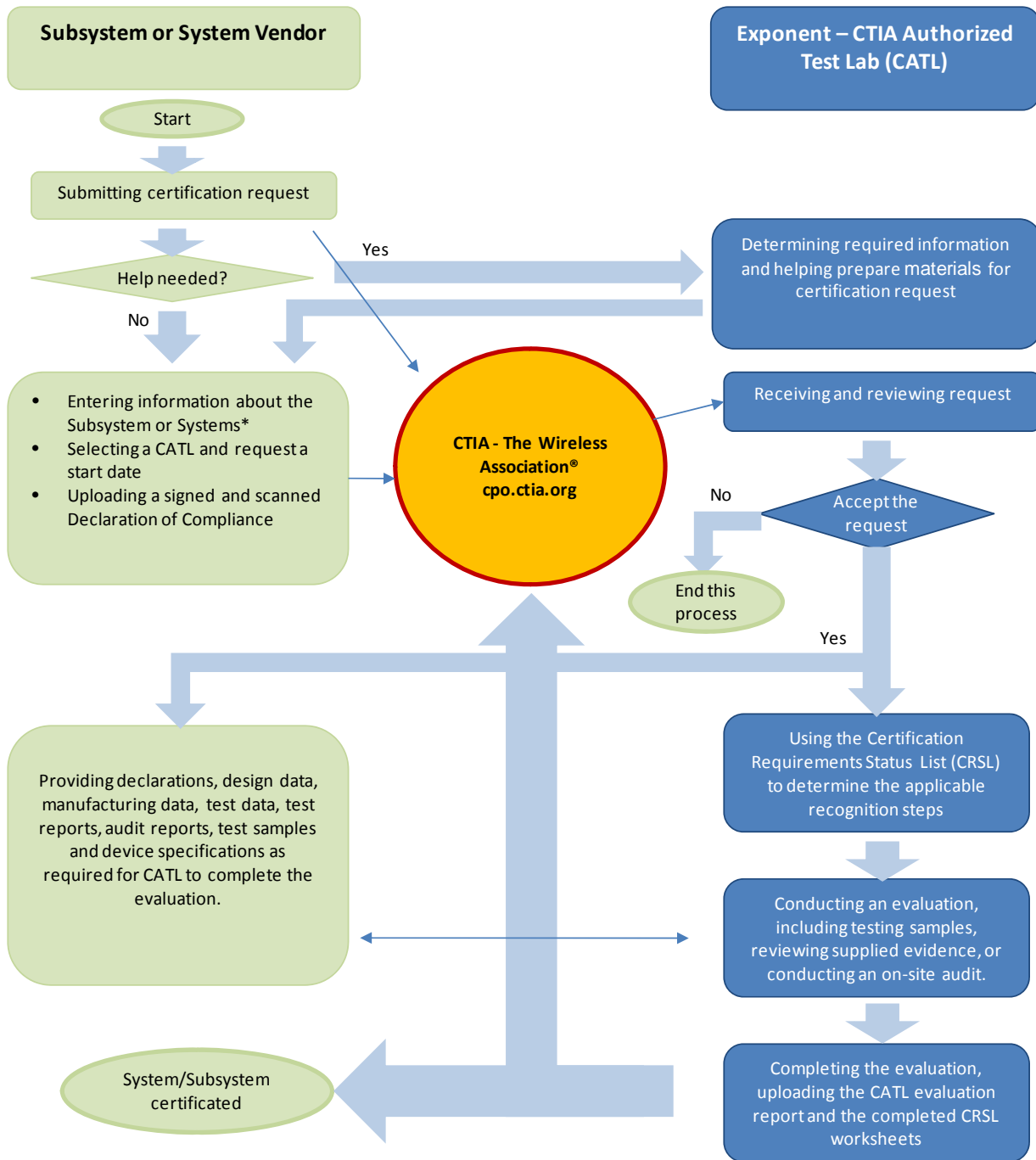
- Assist our clients in preparing for CTIA battery certification.
- Provide auditing preparation services to prepare for a CTIA factory audit.

Compliance Services:

- Cell Manufacturing Audit – Exponent performs auditing services for CTIA compliance.
- Cell Testing and Review.
- Battery Testing and Review.
- Host Testing and Review.
- Adapter Testing and Review.

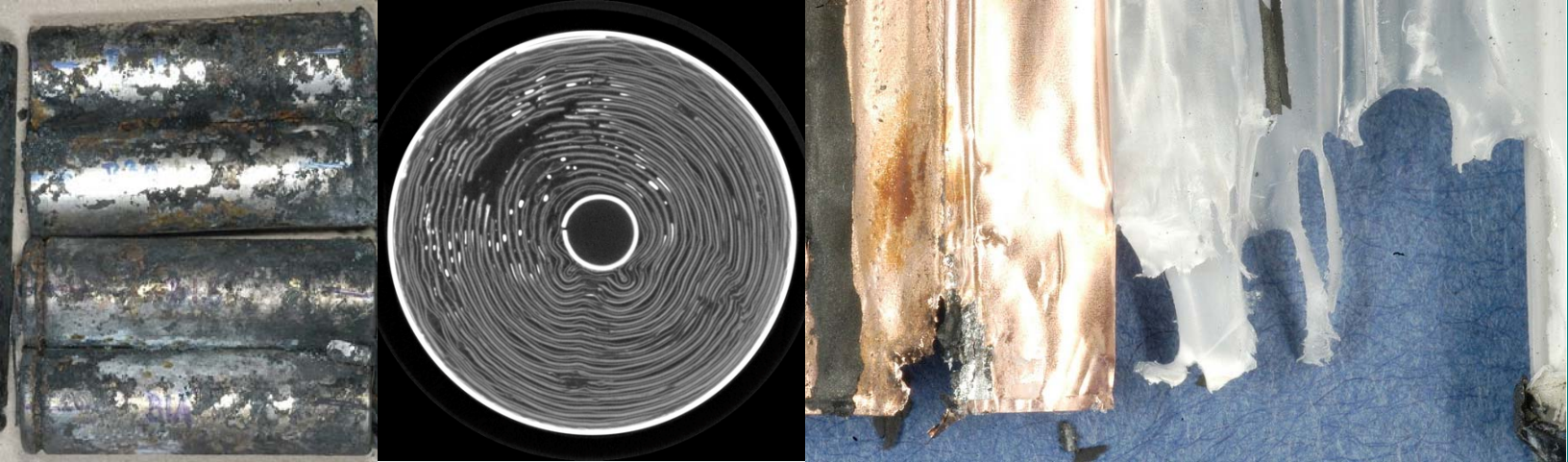


Process of CTIA Certification



* System: A combination of cell(s), battery pack(s), host, and adapter(s).
 Subsystem: a Cell, Battery Pack or Adapter.
 For System vendors: To recognize the System, all sub system shall be recognized.





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