Battery Fingerprint Technologies

Battery diagnostics for manufacturers and users to improve capacity, reliability, and safety

Emilia Silletta

AEC 2018 - March 27th, 2018
Samsung Galaxy Note 7
Current quality control procedures

Mass measurements  Physical measurements  Electrochemical testing

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Samsung battery defects (January 2017 press release)

Battery A

Abnormal

Main Cause

The negative electrode was deflected in the upper-right corner of the battery

Normal

The negative electrode is not deflected
Magnetic Resonance Imaging

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Magnetic Resonance Imaging
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Reproducing battery defects

The Battery Prototyping Lab at Rochester Institute of Technology

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Common defects found in the production line:

- **Folded Electrode**
- **Missing Electrode**
- **Extra Scraps**

Defects

Magnetic field maps

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Current Distribution in Li-ion Batteries

Healthy Battery

Damaged Battery
Current Distribution in Li-ion Batteries

Plain Stacked-Electrode

Jelly Roll

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Market

- Mining
- Space Applications
- Consumer Electronics
- Power Invertors
- Energy Storage System
- Electric Vehicles (EV, HEV, PHEV)
- Defence / Military Applications
- Lithium Ion Batteries
- Railways
- Marines and Submarines
- E-cigarettes
- Telecom Towers
- Solar and Wind Energy Storage
- E-bikes
Manufacturing process

Cathode Line

Assembly

Filling

Charge Formation

Grading

Packing

Anode Line
Manufacturing process

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Manufacturing process

Cathode Line

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Assembly → Filling → Charge Formation → Grading → Packing

Current quality control

Anode Line
Manufacturing process

Cathode Line

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Assembly

Filling

Charge Formation

18%

Grading

Packing

Anode Line

Current quality control

82%
Core Team

Prof. Alexej Jerschow
Physical Chemist
Professor of Chemistry

Mohaddese Mohammadi
Electrical Engineer
PhD candidate

Dr. Emilia Silletta
Physical Chemist
Postdoctoral Researcher

Battery Fingerprint Technologies
Go to Market

We have entered to the program, March 2018

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Meet our Awardees

Battery Fingerprint Tech

MRI based technology that can diagnose a battery’s health without destroying the battery

The Project
Batteries are ubiquitous. They are in our phones, computers, cars and airplanes. The use of alternative energy and electrically powered vehicles will further increase the demand for better and safer batteries. The well known Samsung disaster caused by defective batteries, cost Samsung $5B in the recall, and $25B in the stock market. This incident along with others (GM, recall, Dreamliner grounding highlights the importance of battery performance and reliability for the success of battery integrators, such as cell phone manufacturers and electric vehicles.)
Go to Market

Proof-of-principle demonstration at high field

Proof-of-principle demonstration at low field

Image analysis and database design

Classification of failure modes. Software development

MS 1

MS 2

MS 3

MS 4
Go to Market

Proof-of-principle demonstration at high field

MS 1

Proof-of-principle demonstration at low field

MS 2

Image analysis and data base design

MS 3

Classification of failure modes. Software development

MS 4

- We have to **install** the instrument in a production line

- We need **batteries** to growth the data base

- Costumer discovery
Contact us

batteryfingerprinting.com
Supplemental Slides
Business Model

Hardware + Software

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- Non-defect
- Folded electrode
- Missing electrode
- Extra scraps
- ...

Algorithm (compare it to a database)
Scientific References

Market and Scalability

$5 billion cell phone battery market

$25 billion LIB market

$65 billion battery market
There is currently not direct competition

**Competition**

**X-ray-CT**

- Non-destructive
- 50 min per battery
- Not specific to chemical changes
- A trained operator is needed

*Feasible*

This technique does not provide current distribution information

There is currently not direct competition
Potential Partnership and Strategic Investors

- Medial applications
- Process control for Oil and gas
- Rock core analyzer
- BATTERY QUALITY CONTROL

They can help us to develop the business plan and get connection

Provide us batteries and the installation of the demo in their production lines
Business Model

Cost to manufacture cell phone batteries
Advisors

Bill Acker
Executive Directory

John Cerveny
Director of Resource Development

The Battery Prototyping Lab at Rochester Institute of Technology

Networking

NY BES+
New York Battery and Energy Storage Technology Consortium

Eastman Business Park

Provide us batteries and the installation of the demo in their production lines

Battery Fingerprint Technologies
Capital Raise

- $50k  NYU TAC Fund
- $125k  Daimler Research Agreement
- 150k  PowerBridgeNY

Under review/consideration
- $300k  NSF CBET grant
- $200k  NSF Partnerships for Innovation
- $50k  Toyota Fellowship