LITHIUM-ION BATTERY RECYCLING PRIZE

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Submission Title:	Battery Sorting With Voltammetry & Impedance Data
Submission Track:	Track 2 – Separation and Sorting

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Concept

We propose designing a high-throughput device programmed to perform electrochemical measurements called Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS) in an automated fashion. Data generated by this **Electrochemical Battery Sorting System (EBSS)** will constitute the three key conclusions all battery recyclers care about during sorting, namely:

1) Battery cell chemistry (including subcategories of Li-ion cells)

2) State of Charge (SOC) as expressed as a percentage of total capacity

3) State of Health (SOH) as expressed on an A-F grading scale

Approach

We will answer the following questions in Phase I:

1. How do peak positions and voltammetry profiles obtained during a CV differ from one cathode composition to another of Li-ion batteries?

2. Do peak positions and profiles obtained during a CV depend on SOC?

3. How do peak positions and profiles obtained during a CV change with respect to battery degradation (SOH)?

4. Can information obtained from CV, combined with EIS, be used to develop models to predict SOC, SOH and cathode composition of Li-ion batteries?

Potential Impact

Using a subscription model for EBSS modules, we propose charging customers $9,000 per month per module to use at their facilities. This “subscription service” would include full service and support to ensure uptime for the equipment is as close to 100% as possible.

If a customer had a 24 hour per day recycling operation operating 7 days per week, they could expect to sort approximately 2.6 million batteries per month with a single EBSS module in operation, equating to an incremental cost of $0.003 per battery sorted with the EBSS. This assumes we reach our target sorting speed of 1 battery per second. If a faster throughput can be achieved, the incremental cost will decrease substantially.