Dual Function Solid State Battery with Self-forming Self-healing Electrolyte and Separator

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

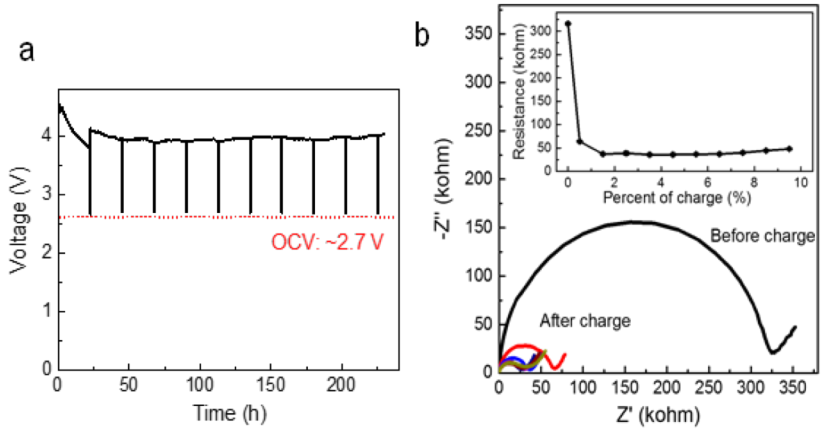
PI/Co-PI: Esther S. Takeuchi / Kenneth J. Takeuchi / Amy C. Marschilok (Stony Brook University, SBU)

- ***Objective:*** Demonstrate a solid state rechargeable battery with in situ generation of a lithium metal anode and iodine cathode.

Impact:

- Opportunity to meet or exceed the target of 250 Wh/kg with a high energy density battery with a self-forming, self-healing solid state electrolyte / separator
- Gain technical insight regarding control of electrode-electrolyte interfacial properties and improved conductivity solid electrolyte with self-healing nature

Successful In-situ formation of Li/I_2 cell



(a) Intermittent charging with OCV shown and (b) AC impedance results for LiI electrolyte based cell.

Accomplishments:

- Identified solid electrolytes with conductivity ≥10^{-3} S/cm
- Demonstrated feasibility of successful in situ formation of solid electrolyte cells
- Demonstrated OCV stability for cells after charge showing successful in situ formation of a Li/I_2 cell
- Identified formation of iodine and lithium via material characterization after charge
- Developed an initial cell design allowing demonstration of cell formation, charge/discharge and idenfication of active material formation via ex-situ analysis

FY19 Milestones:

- Determine functional capacity and energy density of construction A cells (Q1)
- Determine functional capacity and energy density of construction B cells (Q2)
- Destructive analysis of construction A cells (Q3)
- Analysis of select construction A/B cells (Q4)

FY19 Deliverables:

- Assessment of functional performance of a solid state cell design

Funding:

— FY19: $400,000, FY18: $400,000, FY17: $400,000