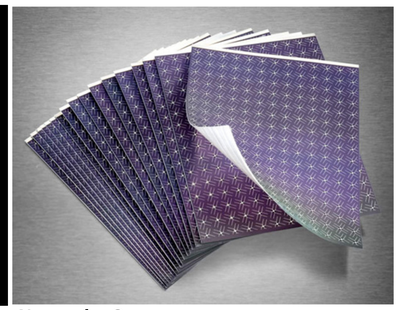
High-Throughput Printed Gel Polymer Electrolyte for Integration with Flexible Energy Storage

Rich Winslow, Zuoqian (Joe) Wang, Chun Hsing Wu, Prof. James Evans, Prof. Paul Wright, UC Berkeley

Motivation

Plastic Logic, Ltd.

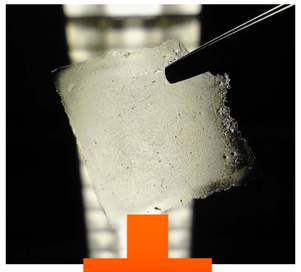


Nanosolar Corp.

Current battery form factors are inadequate

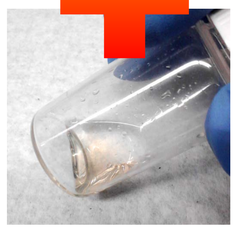
- Rigid
- Many non-rechargeable
- **Form limited by electrolyte**

Proposed Solution



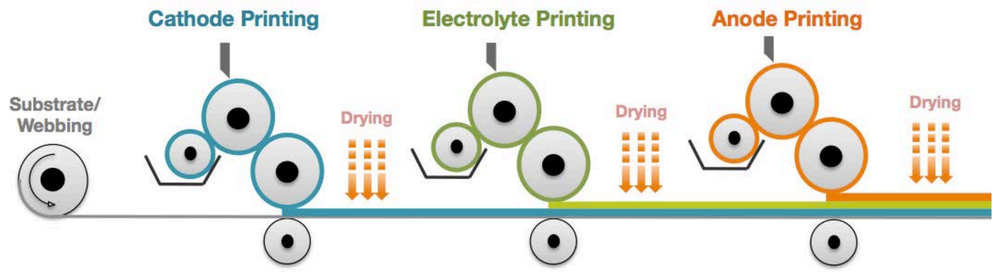
Gel Polymer Electrolyte

(PVDF-HFP)



Ionic Liquid Electrolyte

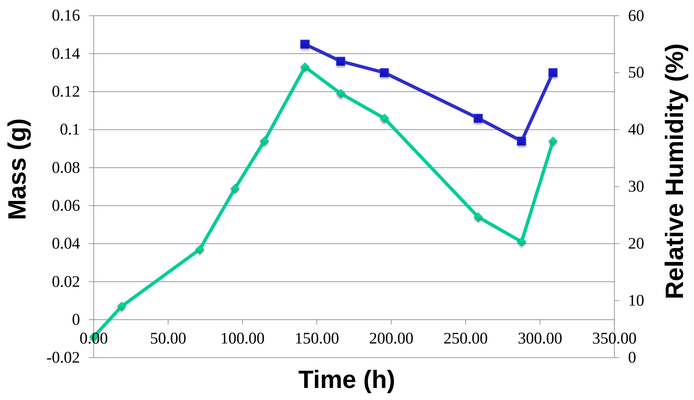
(BMIM Tf)

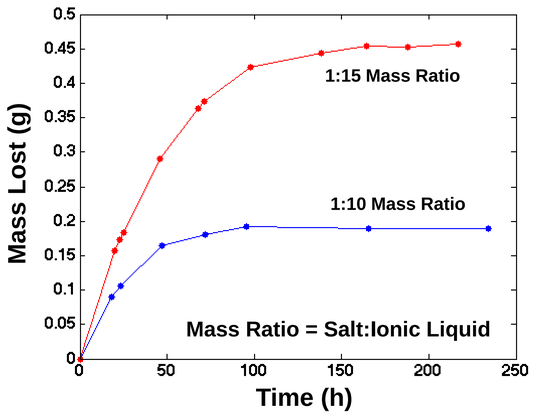


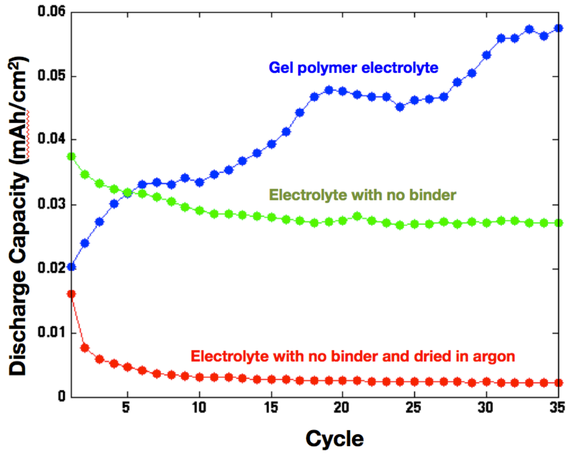
Integrate with flexographically printed battery components

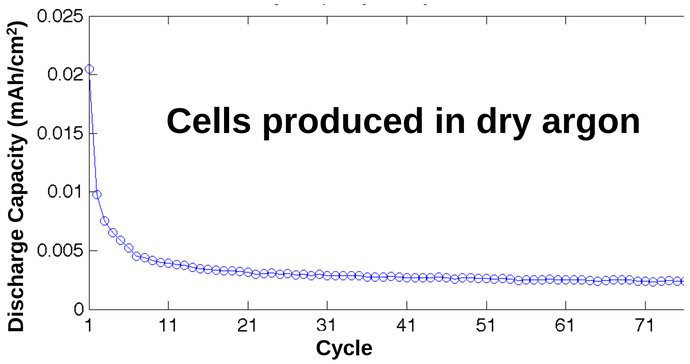
- **Solid**
- **Flexible**
- **Rechargeable**
- **Stable at high temperatures**
  - o (>100 ˚C and 3.5V)

Current Progress – Chemistry Optimization









- **Water is a major influencing factor in cell performance**
- Materials are very sensitive to the relative humidity in the environment
- Water improves performance to a degree
- Salt concentration shown to affect water retention

Future Work

- **Optimization of printability and mechanical properties**
  - o Film thickness uniformity
- **Electrochemical optimization**
  - o Quantify effects from water
  - o Correlate relationships between compositional elements
- **Identify half reaction at cathode**
- **Quantify electrochemical influence of water on half reactions**
- **Full cell characterization and integration**
  - o Discharge limits
  - o Thermal characterization