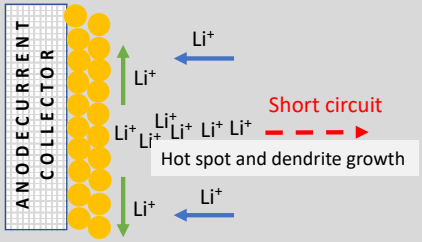
Superior Performance Battery

S. Petrovic

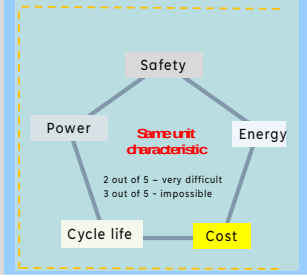
Fundamental problems with batteries::
- Li penetration by growth of dendrites --> electrical short
- Formation of hot spots during charging
- Low cycle life: cathode cracks.

Advanced Battery
- 70% performance improvement in specific energy and energy density, 100% improvement in power density, doubling the cycle life, and lower manufacturing costs.

Charging process on the anode (simplified)



Main battery considerations



A unique electrode configuration based on thin structurally modified polymer is used to provide high-surface area substrate for Li batteries.

Light-weight, flexible, high-surface area current collector, inert and long-lasting, and inexpensive.

Advanced battery manufacturing.

Large three-phase boundary
Large true surface area
High current
Low current density
No dendrite format.
Fast charge

Component/ Property	Conventional Li-ion battery	Polymer Battery	Estimated improvement factor*
Mechanical shape	Rigid, button, cylindrical, pouch	Flexible single cells and stacks – any shape possible	Multiple advantages
Current density	Poor, due to high ionic and electronic resistance, no defined 3-phase contact	Very high due to high surface area current collector	3x
Volume and thickness	Large: thick electrodes (50 – 80μm)	Very thin electrodes (5 μm); small volume	10x
Energy content, i,.e., specific energy	Low: thick electrodes, heavy current collector, slurry additives, separator	Very high (~ 5 time higher): Li metal anode and very small weight of the polymer	3-5x
Cycle life	Low: mechanical problems with contraction and expansion	High cycle life: no mechanical problems	3-5x
Safety	Low to moderate: Li plating and dendrites	Very high: no Li plating, no dendrites	5x less probability
Use of solid electrolyte	Very difficult: thick electrodes	Seamless process integration	/
Cost	High: multiple separate processing steps	Low: continuous multicell/stack manufacturing	3x

70% performance improvement in specific energy and power

100% improvement in energy density

Doubling cycle life

Completely safe

Low cost

Roll-to-roll manufacturing

One-step stack formation

Rapid factory implementation

Patent protected

LOW RISK

Feasibility Demonstrated