



# Prototype Machine for Coating Stabilized Lithium Metal Powder



Team Members: John Magner, Marcos Leon, Vannesa Palomo, Maria Sanchez, John Shaw, & Benjamin Tinsley  
ME #16/ ECE#18

## Motivation:

- Stabilized Lithium Metal Powder, also known as SLMP, is a newly developed product by FMC Lithium Corporation
- Metallic Lithium content is roughly 98%
- Particle size: Between 30-60 microns
- Density: 0.534 g/cm<sup>3</sup>
- SLMP is used as a sacrificial layer of lithium to compensate for the first-cycle capacitance loss.
- Increases the batteries performance by 5 to 15%.
- Increases the energy density by 2-4 times.
- Can be applied to pre-existing anodes

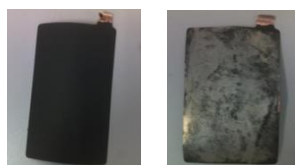


Image 1.1: (Left) Hard carbon electrode. (Right) Hard carbon electrode coated with SLMP



Image 1.2: Optical Microscope image of SLMP.

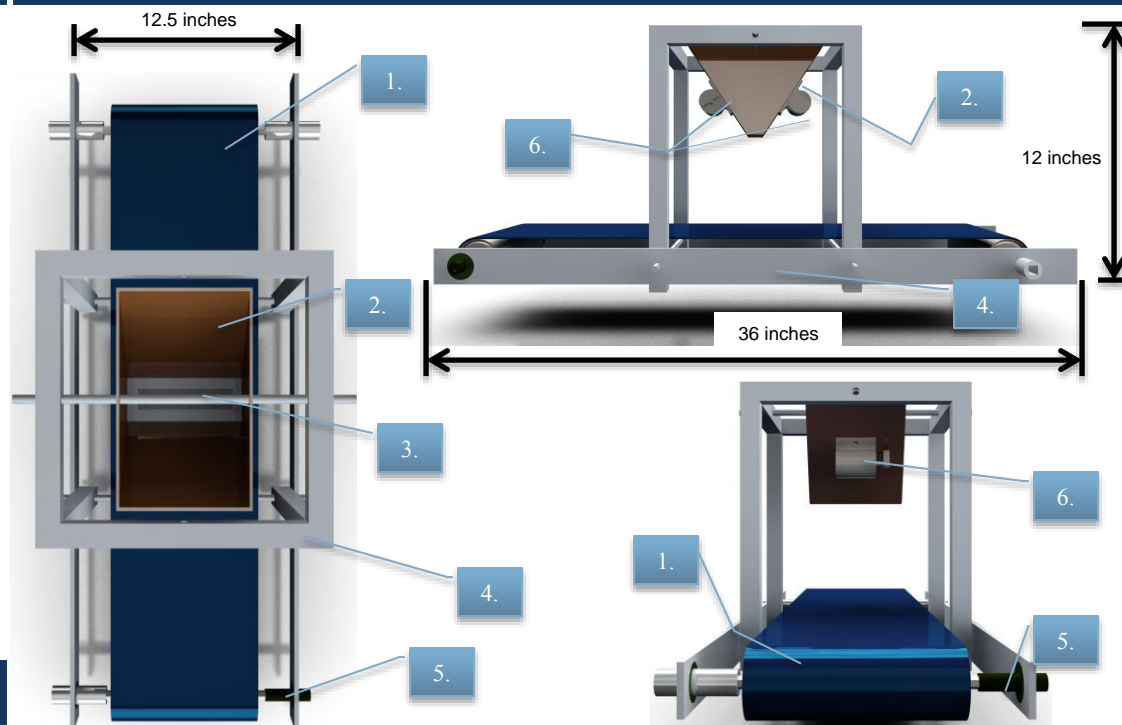
## Purpose:

To create a cost-effective prototype machine that can create a uniform layer of SLMP, minimum of 150µm, on a pre-existing anode.

## Technical Approach:

- Application of SLMP onto a pre-existing anode by utilizing vibrational forces and constant flow rates through steel wire meshes.
- SLMP will be fed into a steel funnel that will have 2 DC vibration motors, running at different frequencies to assist in the dispersion of the SLMP through the meshes placed along the length of the funnel. The SLMP will be dropped onto a conveyor belt which translates the anode sheet back and forth underneath funnel exit until fully coated.
- After this process is completed the coated anode is manually pressed to expose the inner lithium to form sacrificial layer for batteries and super capacitors.

## Coating Machine Design:



## Component Breakdown

1. Conveyor Belt System
2. Funnel
3. Meshes
4. Frame/Body
5. Hexagonal Adaptor
6. DC Vibrational Motors/ Actuators

## Electrical Hardware:

- Gear Bipolar Stepper Motor
- Arduino Mega 2560 R3
- 12 V power Supply
- 12 V DC Vibration Motors: (1)-3000 RPM and (1)-4000RPM

## Future Recommendations:

- Addition of a stabilizing base plate as foundation for entire prototype
- Experimentation with different funnel and support rod material
- Exploration of linear vibrational methods rather than vertical displacements
- Addition of positioning and weight sensors