

## **American-Made Solar Prize Power Bloom Team Technical Requests**

Following is a list of equipment and other support Power Bloom expects to need as we develop our proof of concept, prototype and then rapid innovation:

### **Characterization and Analysis Equipment**

- Laser Scanning Optical Profiler with an XY resolution ~ 10s of nanometers and Z resolution of 1nm
- Optical and Electron Scanning Microscope ~ 135 X / 150,000 X
- Drop Shape Analyzer
- Differential Scanning Calorimeter
- Rheometer ~ -40° C to 200° C
- TRI-Solar Class Simulator ~ 1 Sun AM 1.5G w/ 300 X 300 mm capacity
- Sheet Coater – flat-bed slot-die coater ~ 300 X 300 mm capacity
- Mini Roll Coater – slot-die coater with flexographic printing unit for flexible substrates
- Thermal Nanoimprint Lithographer
- Temperature and Humidity Chamber ~ -73° C to 177° C and 10% to 95% humidity range
- Particle Analyzer ~ 0.3nm and 10µm.
- UV-Vis Spectrophotometer for liquid and solid samples ~ 190 to 1100 nm
- Solar Simulator to test I-V characteristics ~ 1 Sun AM 1.5G and 300 X 300 mm heating & vacuum
- Mass Spectrometer ~ parts per trillion
- External Quantum Efficiency System
- Incident Photon-to-Charge Carrier System
- Thermal Evaporator with Glovebox ~ 10V. 100 X 100 mm / 600° C / 0 – 50 rpm

### **Fabrication Equipment**

- Semi-automatic Screen Printer ~ 300mm X 300mm
- Flat-bed Slot-die Sheet Coater ~ 300mm X 300mm
- Mini Roll Coater – slot-die coater w/ flexographic printing unit for flexible substrates
- Humidity Control Room ~ 10 to 60% at 70° F
- Roll-to-roll Printer ~ 6 to 12 inches & 200m/min web speed
  - Flexographic & Screen-Printers, Slot-Die Coater 2 X 7.5 meters

### **Additional Support is Requested**

- We will need assistance to optimize encapsulant materials
- We have identified a partner for conductive inks but expertise in this part of the value chain will also be important.

### **Engineering Support**

Our business plan is based on using an open innovation lab partner. We will need to partner with a lab that is staffed by qualified engineers and technicians with backgrounds including morphology of OPV layers. Power Bloom will have our science and engineering staff co-located and will manage the material testing and fabrication processes.

Access to NREL's "**Materials Flows through Industry Supply Chain Modeling Tool**" to track materials (conductive inks, substrates, equipment, barrier layer, etc.) and engineering support to properly apply this tool to the manufacturing of OPV.