Down-converting Encapsulation Film to Enhance Silicon Solar Cell Efficiency

University of Washington (UW)

Christine Luscombe, Professor in Department of Materials Science and Engineering at UW

Phillip Cory, MBA Candidate at UW

Yunping Huang, PhD Candidate in Department of Materials Science and Engineering at UW

Our prototype is an efficiency-boosting encapsulation film that can be directly applied to current standardized silicon solar cell assembling lines. There are two key components in the film: a low-cost and eco-friendly fluorescent dye and ethylene-vinyl acetate matrix.

Our team is now at the stage of prototyping, and we are planning to utilize roll-to-roll printing, which is a low-cost and efficient fabrication technique, to produce the dye-embedded encapsulation film. The roll-to-roll printing facility is available in the at the University of Washington's **Clean Energy Testbeds**, in addition to other solar cell characterizations facilities, such as vacuum laminator, solar simulator, external quantum yield system, environment aging chambers. The facilities required for prototype fabrication and characterization are made accessible by Clean Energy Testbed. Moreover, the staff scientists in Clean Energy Testbed are ready to offer help in the instrumentation, which would be valuable to our team. Currently, our team members are enrolled students at the University of Washington. This physical adjacency will significantly accelerate the prototyping process, considering advantages in experimenting using an iterative process.

Since we anticipate our material technology can be directly fitted into the existing solar cell assembling line, we highly value technical discussion with solar manufacturers during this prototyping stage, regarding the manufacture and assembly process, and the expectation of the final production. Feedback from both component and final product manufacturers will inform the development of prototypes, particularly once a successful proof-of-concept has been developed illustrating that increased solar yield is possible. Solar cell manufacturers, such as **Sun Energy Inc** in the AmericanMade Network, or other manufacturers in the **Solar Energy Industries Association** can provide crucial guidance in these areas. Moreover, we would like to collaborate with solar cell manufactures to develop a cost-effective solar cell, leveraging the different types of silicon solar cells, such as monocrystalline, polycrystalline and amorphous.

Device liability and field testing are critical aspects to be investigated after building functioning prototypes, where the aforementioned industrial connections would play important roles. We would like to partner with Connectors to accelerate testing of our encapsulation layer alone and the final integrated device, leveraging their comprehensive testing capabilities. As part of this testing, we will also evaluate the stability of the materials to understand how to match the lifetime of silicon solar cells, and how to optimize for efficiency and stability.

Finally, we hope to incorporate the above technical activities into considerations around business development and fundraising activities. Connectors with experience in consulting and fundraising will be particularly valuable.