Technical Assistance Request
Bringing Photonic Revolution to Solar Energy with Photonic Smart Coatings

Converting sunlight into electrical energy via photovoltaics faces two big problems. First is the collection and trapping of photons in the device. Second is the conversion of as much of the photon energy into carriers (electrons and holes) as possible. That is, the photon energy should be matched to the energy required to create the carriers as closely as possible. We will solve these problems with an exciting new technology being developed for large-scale manufacturing by SunDensity. The existing solutions are geared towards creation of multi-junction solar cells using II-VI and III-V combination of materials, such as, CdTe, GaAs, etc. The process involved in the creation of the band-gaps that absorb more photons from the broad solar spectrum are expensive and cannot scale to compete with the mono and poly c-Si solar panels produced in China and South Korea. Hence, we need fresh thinking where we can keep the advantage of low price of the c-Si solar panels while increase the power output on per panel basis to reduce the levelized cost of energy to gain wide spread adoption of solar power.

As the solution to the one of biggest problem in the American made solar prize, we have designed the photonic smart coating that can efficiently downconvert the UV and high VIS photons into low energy near infrared photons with energy close to energy of the band-gap in any solar cell starting with c-Si solar cells. The coating can be applied to the inner side of the solar panel cover glass and create an elegant solution of managing photons going into the solar cells. We have proven our technology at the lab-scale by taking a 22% efficiency solar cell to operate at 27% efficiency adding enhancement of power output to 20% from the same solar cell. Now our goal is to create a scalable additive manufacturing process using in-lined AI powered magnetron sputtering smart coating manufacturing process to coat millions of glass per year and make a major impact on the American made solar prize by ushering the era of fourth and fifth generation solar panels for reducing carbon emission and save the planet earth.

For this purpose, SunDensity team will collaborate with the National Renewable Energy Laboratory (NREL) which is transforming energy through research, development, commercialization, and deployment of renewable energy and energy efficiency technologies. SunDensity will collaborate with NREL for developing the methods for characterization of photonic smart coatings in the context of solar panels. This will include transmission, reflection and absorption of photons from 300nm to 1200 nm wavelength. This will potentially lead to setting up test procedures and standards for the America made fourth generation photonic solar panels. At present, we are in the process of signing a Statement of Work with David Miller and Erica Bishop's group at NREL.

With a powerful network and resources, the American Made Solar Prize challenge can help us take our innovation to its commercialization and thus propelling solar energy adoption into the next generation of clean power.