Bringing Photonic Revolution to Solar Energy with Photonic Smart Coatings
NISH SONWALKAR / SUNDENSITY

Project Summary

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. As the solution to the one of biggest problem, 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% form the same solar cell.
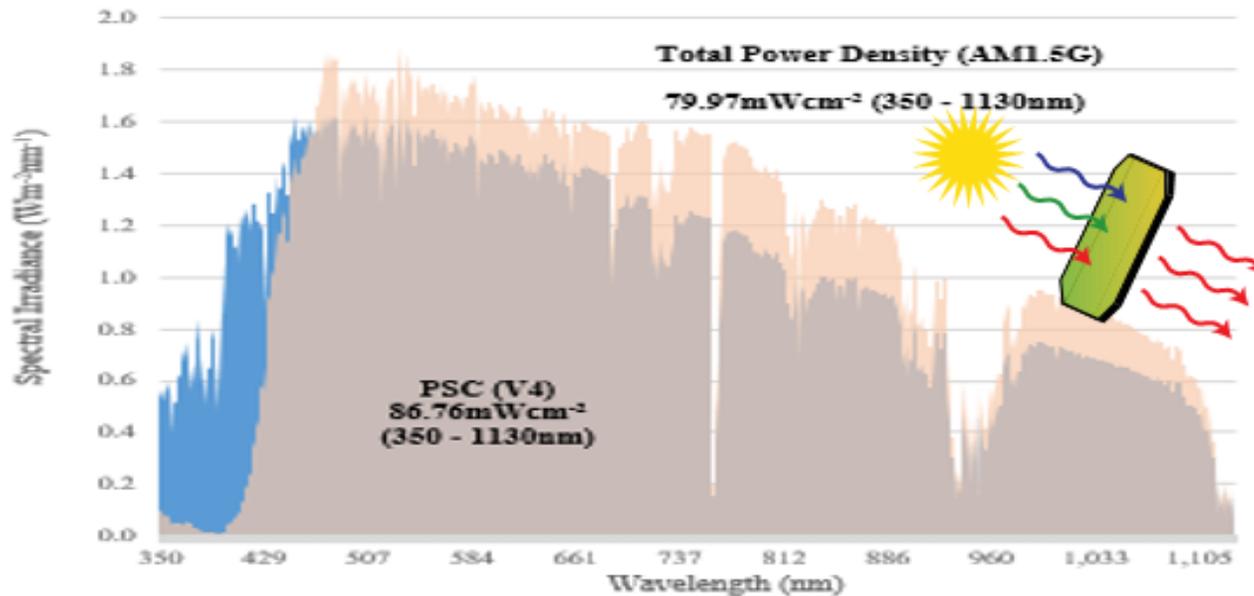
Key Personnel/Organizations

Dr. Nish Sonwalkar, Samuel Tyler Phillips, Smail Lahlou, Ashley D. Lemus

University of Rochester - Prof. Scott Carney

Rochester Institute of Technology – Prof. Santosh Kurinec

Key Milestones & Deliverables

Development of scalable nano-optical coating samples, optical testing and third party solar panel validation of the increase in the panel energy output

Project Impact

To increase the energy output of garden variety c-Si solar panels by 6% to 8% significant energy output, with marginal increase in the cost of the overall panel by using coated glass will reduce the LCOE. The coating will improve the life-span of the solar panels to 35 years with marginal degradation of the solar panel performance. The project will be a big step to reach target LCOE of 3 cents/KWhr before 2030 goal.

Figure 1: Down conversion of Solar Spectrum for increasing efficiency of PV solar panels