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Perovskite Startup Competition

Technical Assistance

Solar cell characterization tools have enabled rapid improvements in photovoltaic materials and device architectures as well as subsequent cost reductions, especially for silicon solar cell technology.[1] As the U.S. looks to increase domestic solar cell manufacturing, the emerging technologies of perovskite and tandem architectures will become increasingly important. To enable major improvements in power conversion efficiencies as well as stability for these technologies, characterization tools that are capable of rapidly assessing new material formulations, passivation strategies, and device architectures will be critical. This not only offers utility when studying device efficiency or stability, but also has potential future applications in high-throughput manufacturing lines.

Optigon is a spinout company from one of MIT's largest solar research groups, the TATA-MIT GridEdge Solar Research Program. Our team is focused on developing characterization tools that accelerate research and enable a fundamental understanding of the mechanisms relevant to efficiency and stability of perovskites. We intend to utilize novel, high-throughput characterization techniques to identify correlations between rapidly measured material properties and relevant photovoltaic performance metrics. This approach will allow for the development of performance forecasting models that can be used to accurately predict the performance ceiling of perovskite devices after each step of their fabrication process. As a result, we will shorten the feedback cycle when developing new perovskite formulations and architectures while also providing a foundation for in-line manufacturing metrology systems and process control.

In the beginning of our venture, Optigon will manufacture simple perovskite architectures on an in-house blade-coater. These devices will serve as both the beginning of our device iteration as well as sample devices to test our measurement techniques. In order to verify our measurements from our tool, **we will need access to calibrated measurement tools, such as a solar simulator, absorption spectroscopy, and photoluminescence/electroluminescence mapping.** The verified measurements will also serve as the first data set for development of our models. Next, we would like to supplement this data with additional data from external sources to increase both the size and diversity of our data in order to make our models as robust as possible, which **will require sourcing sample devices from other labs and facilities.** When our measurement techniques are more mature, **we will require access to external capital intensive manufacturing machines, such as a slot-die coater and a roll-to-roll printer**. These machines will not only allow us to directly test our measurement capabilities in the manufacturing context, but also provide additional manufacturing experience and a large amount of test samples to supply data to our models.

(1) Trupke, T.; Mitchell, B.; Weber, J. W. *et al.* Photoluminescence Imaging for Photovoltaic Applications. *Energy Procedia* **2012**, *15*, 135-146.