

Scalable Manufacturing of Perovskite Solar

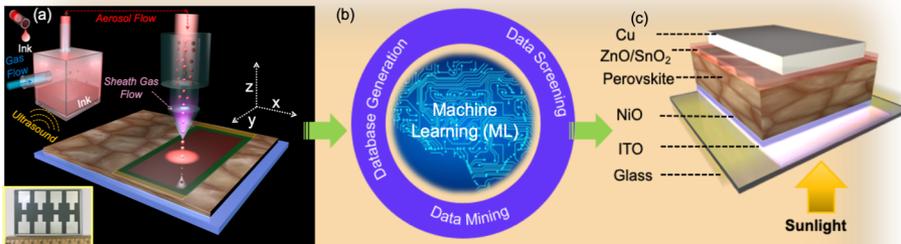
Smart Spray for Everyone's Solar

CAPTAIN: SANTANU BAG/ASTERSOLAR

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Project Summary

AsterSolar team aims to develop and commercialize low-cost perovskite solar cells based on aerosol-jet assisted spray coating (AJSC) technology. AJSC is a rapid and cost-effective film deposition technique that can be applied to wide area substrates with minimum materials consumption. The use of automation and Machine Learning (ML) in the AJSC process could further improve manufacturing time, cost, and process reproducibility. In this project, AsterSolar, in collaboration with partners will develop the ML based AJSC manufacturing platform that will improve the uniformity of absorber and charge transport layers' coating on large area substrates in a more automated, reproducible, and scalable way, as well as characterize and improve performance in corresponding integrated photovoltaic (PV) cells. We will fabricate 30x30 cm² modules, improve stability, present a cost model, develop supply-chain knowledge, analyze possibilities to reduce production costs, and identify a reasonable target market.



Schematic of (a) thin-film deposition of perovskite by an aerosol-jet assisted spray coating (AJSC) process (inset: fabricated perovskite solar cells on glass), (b) development of machine learning for process optimization, and (c) targeted low-cost perovskite device structure to be studied in this project.

Key Personnel/Organizations

Dr. Santanu Bag/AsterSolar (Captain)

-Dr. Rahul Bhowmik (ML Scientist)

-Daniel Clark (Marketing Director)

-Trent Fisher (Chief Operating Officer)

-Ricardo Mota (Robotics Engineer, Intern)

Prof. David Mitzi/Duke University (Partner)

Dr. Oki Gunawan/IBM Thomas J Watson Research Centre (Partner)

Dr. Daniel Stieler/PowerFilm Solar (Partner)

Dr. Michael Durstock/Air Force Research Laboratory (Partner)

Sono-Tek, Milton, NY (Equipment Manufacturing Partner)

Intellectual Property (IP)

Dr. Bag's inventions (6 issued patents): Owned by Air Force Research Lab will be licensed by AsterSolar for further development

Key Deliverables

End of Lift-off Contest:

a) >18% Efficient prototype module (connecting 44 cells and active area of 825 cm²) from AJSC processed perovskite and charge transport layers, b) A robust ML model with >85% predicting accuracies, c) Module stability (T80) at 85/85 (fully encapsulated) : >5000 hrs.

Project Impact

- AJSC process could significantly improve the throughput (av. 200 m²/h) of large area perovskite manufacturing and lower the production cost (Estimated US manufacturing cost ≈\$100/m²).
- ML produced algorithms could rapidly improve the process optimization time for accommodating new variables in the perovskite solar manufacturing line without potential production stops, thereby increasing the manufacturing efficiency.