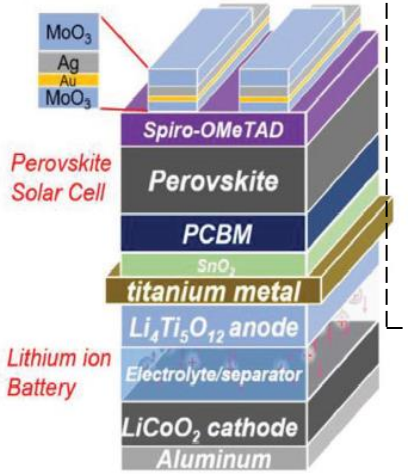
Solar cells with Intrinsically Integrated Batteries

Current market problems:

- Consumer electronics : wired charging
- Electric vehicles: charged using fossil-fuel
- Renewables photovoltaics Grid: Intermittency of sunlight



PV-battery integration

Solutions:

- Consumer electronics : unwired charging
- Electric vehicles: charged using solar cell.
- Renewables photovoltaics Grid: Use of battery during no-illumination or at night

Technical challenges:

- Low overall efficiency of solar-Battey integrated device
- Low output voltage from solar cell to charge batteries
- Capacity or Energy density of battery
- Stability of both units

Team's capabilities:

- Fabrication of perovskite solar cell charging lithium batteries with highest reported efficiency of 9.36%
- Fabrication of rear-illuminated perovskite charging lithium- ion battery with highest conversion storage efficiency of 7.3%
- First time nano-mapping modelling of perovskite-silicon tandem solar cells
- Additive and surface passivation engineering to improve perovskite solar cell's efficiency
- Solid state electrolyte, Additives in electrolyte and artificial SEI layer engineering in lithium batteries

Plans for solution:

- Fabricate perovskite solar cells in series and perovskite tandem structures to charge batteries
- Deposit highly transparent top electrode for maximum light harvest.
- Nano-scale mapping for optimization
- Proper encapsulation for stability

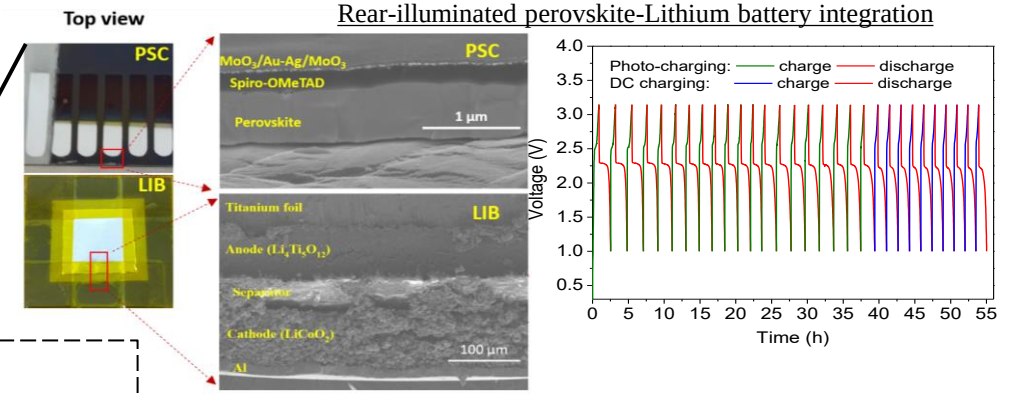
Goals set for executing plans :

- Incorporate perovskite in series and perovskite tandems along with transparent top electrode in the integrated design
- Set! Demo day: Proof-of-concept by building integrated device of small area < 1cm^2
- Go! Demo day: create prototype with larger area ~10cm^2

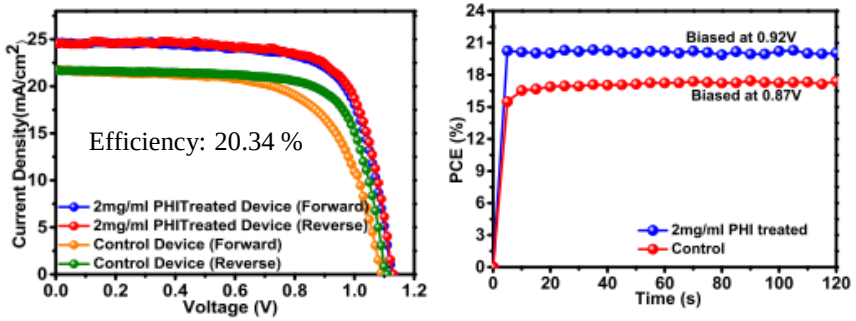
Achieving goals:

- Design Development
- Integrated design fabrication
- Design evaluation
- Quality control testing
- Field testing

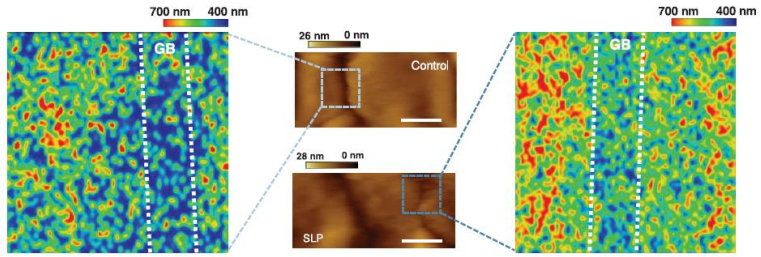
Rear-illuminated perovskite-Lithium battery integration



PHI additive treated perovskite solar cell



Nanoscale mapping of perovskite-silicon Tandem cells



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