Design of Thin-film Photodiodes for Better Thermophotovoltaics system

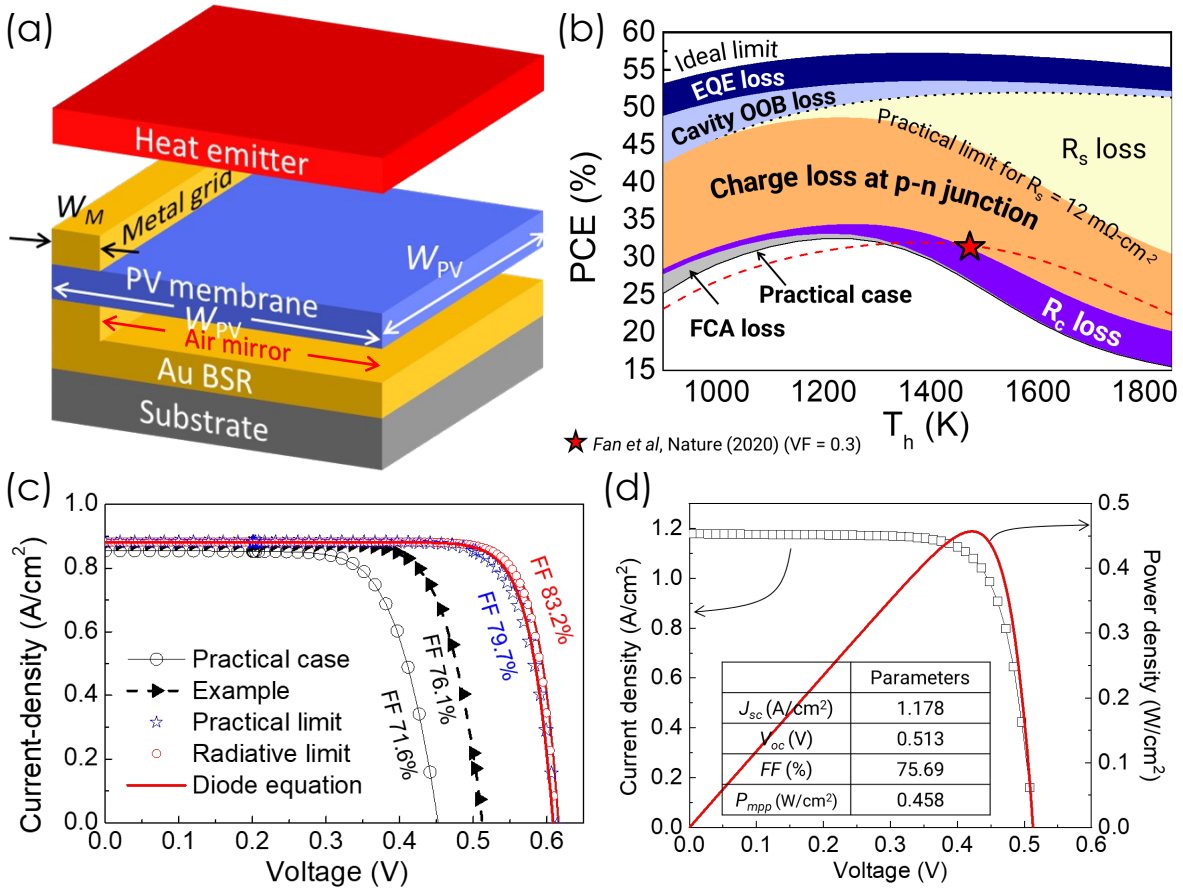

Figure: (a) 3D schematic for a thin-film thermophotovoltaic cell with an air mirror. (b) Mechanism for power conversion efficiency (PCE) loss by extrinsic factors. (c) Simulated *J-V* curves. (d) Measured *J-V* curve of an 0.74 bandgap InGaAs thin-film TPV cell.

Impact

- To develop high-efficiency, optimized III-V thin-film thermophotovoltaic (TPV) cells with an air mirror by understanding extrinsic loss factors

Background and Application

III-V alloys can enable the tunability of bandgaps and thin-film photodiodes for high output power density. Heat to electricity conversion using TPV systems promises the next energy generation method with many merits, such as a wide range of heat sources, scalable power plant spaces, and recycling of heat waste from turbine power plants. Our group is working for the development of new thin-film TPV devices to overcome some practical challenges.

Facilities and Methods

- Conventional semiconductor fabrications
- Molecular-beam-epitaxy
- wafer bonding tools
- Simulation: Synopsys Sentaurus, COMSOL Multiphysics, MatLab

Relevant Papers

- J. Lim et al., *Phys. Rev. Appl*, DOI: 10.1103/PhysRevApplied.16.064010
- D. Fan et al., *Nature,* DOI: 0.1038/s41586-020-2717-7

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