InGaN High-Temperature Photovoltaic Cells

For high-temperature, high-radiation environments

This Phase II project developed Indium-Gallium-Nitride (InGaN) photovoltaic cells for high-temperature and high-radiation environments. The project included theoretical and experimental refinement of device structures produced in Phase I as well as modeling and optimization of solar cell device processing. The devices have been tested under concentrated air mass zero (AM0) sunlight, at temperatures from 100 °C to 250 °C, and after exposure to ionizing radiation. The results are expected to further verify that InGaN can be used for high-temperature and high-radiation solar cells.

The large commercial solar cell market could benefit from the hybridization of InGaN materials to existing solar cell technology, which would significantly increase cell efficiency without relying on highly toxic compounds. In addition, further development of this technology to even lower bandgap materials for space applications would extend lifetimes of satellite solar cell arrays due to increased radiation hardness. This could be of importance to the Department of Defense (DoD) and commercial satellite manufacturers.

Applications

NASA

- Missions near the Sun:
  - Solar Orbiter
  - Solar Sentinels in the Living with a Star (LWS) Program
- Missions in high-radiation environments

Commercial and Military

- Terrestrial DoD applications

Phase II Objectives

- Refine single-junction device structures
- Optimize the processing of single-junction devices
- Demonstrate two-junction devices
- Verify the stability of InGaN solar cells at high temperatures and high radiation environments

Benefits

- Remains stable in high-temperature and high-radiation environments
- Extends lifetime of satellite solar cell arrays

Firm Contact

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