High Radiation Resistance IMM Solar Cell

For efficient, lightweight, radiation-resistant solar power

Due to high launch costs, weight reduction is a key driver for the development of new solar cell technologies suitable for space applications. This project is developing a unique triple-junction inverted metamorphic multijunction (IMM) technology that enables the manufacture of very lightweight, low-cost InGaAsP-based multijunction solar cells. This IMM technology consists of indium (In) and phosphorous (P) solar cell active materials, which are designed to improve the radiation-resistant properties of the triple-junction solar cell while maintaining high efficiency. The intrinsic radiation hardness of InP materials makes them of great interest for building solar cells suitable for deployment in harsh radiation environments, such as medium Earth orbit and missions to the outer planets. NASA Glenn's recently developed epitaxial lift-off (ELO) process also will be applied to this new structure, which will enable the fabrication of the IMM structure without the substrate.

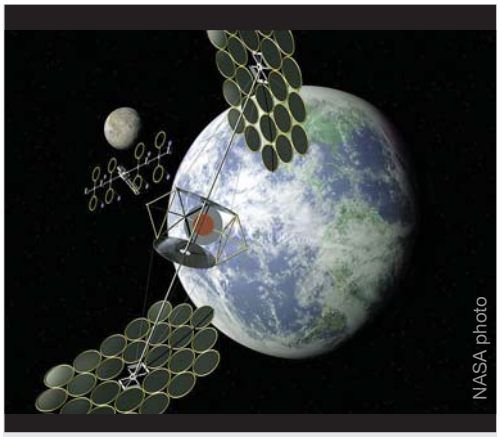
Applications

NASA

- Medium Earth orbit missions
- Outer planet missions
- Satellite power systems

Commercial

- Concentrator photovoltaic (CPV) systems to provide terrestrial solar power



Phase II Objectives

- Reduce efficiency degradation to less than 10 percent
- Develop solar cells with efficiency greater than 30 percent
- Maintain high end-of-life performance

Benefits

- Suitable for harsh environments
- Reduces or eliminates the heavy cover glass materials as required on conventional gallium-arsenide (GaAs)-based cells
- Uses the quaternary InGaAsP subcell rather than the GaAs subcell, allowing the use of a set of bandgaps that better match the solar spectrum
- Reuses multiple times, and ultimately recycles, the GaAs substrate on which the solar cell is grown via the ELO process

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