

NASA SBIR/STTR Technologies

“Novel Solar Cell Nanotechnology for Improved Efficiency and Radiation Hardness”

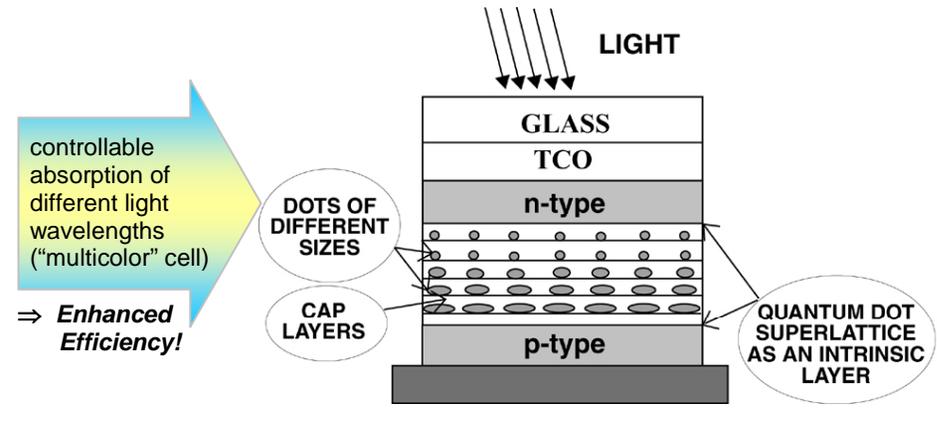


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Identification and Significance of Innovation

- The novel quantum dot (QD) based solar cells may be more efficient and more radiation-hard than the standard multi-junction solar cells. Their radiation response is unknown.
- New analysis/design tools and their experiment-based validation through fabrication of a novel high-efficiency photovoltaic cell via quantum confinement of photogenerated carriers and phonons in quantum dot array nanostructure.
- First demo of Quantum-Dot Solar Cells efficiency and radiation hardness, by computer modeling and experimental prototypes.



Technical Objectives

Development and demonstration of novel, high efficiency, lightweight solar cell technology as well as computational tools for better understanding of radiation effects on photovoltaic cells in the space environment and increasing their radiation hardness.

Work Plan

Phase I: • Use CFDRC’s enhanced modeling tools for research and development of the novel multi-quantum-dot (QD) solar cell technology for improved performance and radiation hardness in space. • Validate with experimental data from Univ. of California Riverside (Prof. Alex Balandin) • Analyze performance and space radiation effects on multi-QD photo-cells by computer simulations.
Phase II: • Model and optimize new QD solar cells for efficiency and radiation-hardness. • Fabricate and test prototypes at UCR.

NASA and Non-NASA Applications

- **NASA Applications:** * Better, more efficient, lightweight, radiation-hardened photovoltaic cells and power generation systems for long-term space exploration missions.
* Computational tools for assessment of novel space technologies and devices based on multi-quantum-dot nano-materials.
- **Non-NASA Applications:** Potential users include all solar-cell and solar-array suppliers, in particular for DoD space vehicles and commercial satellites.

Firm Contacts

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NON-PROPRIETARY DATA