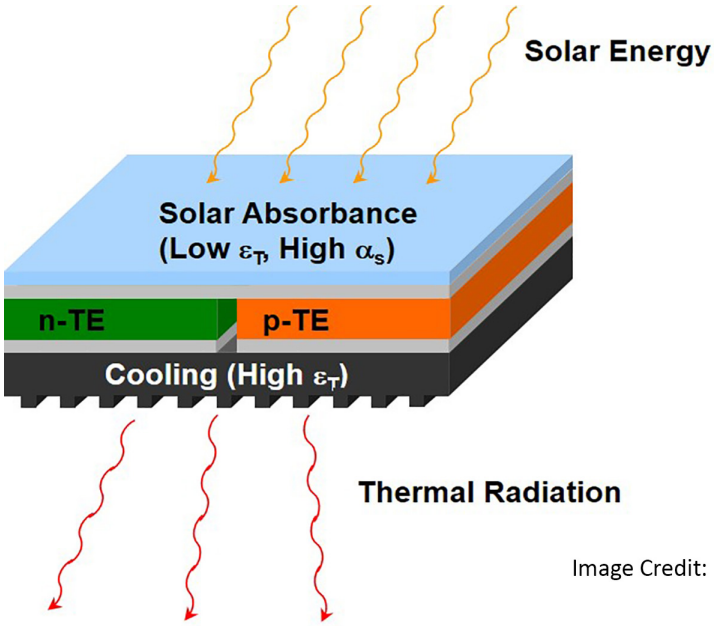


Image Credit: NASA

National Aeronautics and Space Administration

NASA

TECHNOLOGY SOLUTION

Power Generation and Storage

Advanced Efficiency Flexible Solar Film

Flexible composite film offers tailored solution for various applications

The dual solar energy harvesting film offers maximized energy generation in a flexible film form. Some flexibility may be sacrificed for the two stage configuration which attains 700% increase in energy density vs semiconductor alone.

Solar devices may be optimized for greater thermoelectric or photovoltaic conversion for greatest efficiency, but the design family also enables a focus on weight to energy production ratio. Or exchange energy density for increased flexibility.

The benefits of internal structure variation that enable it to capture more energy from a given solar energy situation. The variations include altering the materials and layers of solar absorbance, insulative, conductive, and active semiconducting layers to attain the most efficient design for a given situation.

BENEFITS

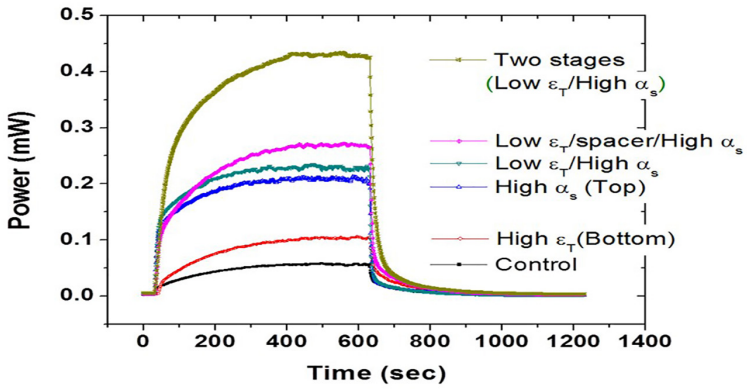
- Film composite offering up to 380% efficiency increase in energy density over base semiconductor
- Optional two stage configuration that increases efficiency to 700%
- Offers varying degrees of flexibility
- Effective with different designs allow for various efficiency to weight or flexibility ratios
- Configurable for thermoelectric and/or photovoltaic energy harvesting

THE TECHNOLOGY

By varying the number, type, orientation and functionality of various solar panel materials, a diverse family of devices can be constructed that can be tailored for many operational concepts. Various solar panel designs can be constructed that include active, cooling, and solar absorbance layers with tailored characteristics.

This flexibility is achieved by arranging multiple solar absorbance layers that are coupled to polymer composite solar absorbance layers. The polymer composite can contain metal salts, oxides and/or carbon nanotubes as needed for various applications. The polymer can be chosen for flexibility or stiffness characteristics as needed by the designer.

Configurations can include cooling layers with zinc oxides, indium oxides, and/or carbon nanotubes coupled between active layers. The carbon nanotubes can be aligned in a particular direction of the second cooling layer to achieve a heat flow bias. The cooling layer may be grooved to match other functional layers to increase the surface area for heat transfer.



Graph indicating power generated via different film configurations vs control, with no film. Image Credit: NASA

APPLICATIONS

The technology has several potential applications:

- Small high performance solar chargers for portable devices
- Higher output solar panels for stationary use

PUBLICATIONS

Patent No: 9,960,288

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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More Information

National Aeronautics and Space Administration

Agency Licensing Concierge

Langley Research Center

Mail Stop 020
Hampton, VA 23681
202-358-7432
Agency-Patent-Licensing@mail.nasa.gov

www.nasa.gov

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