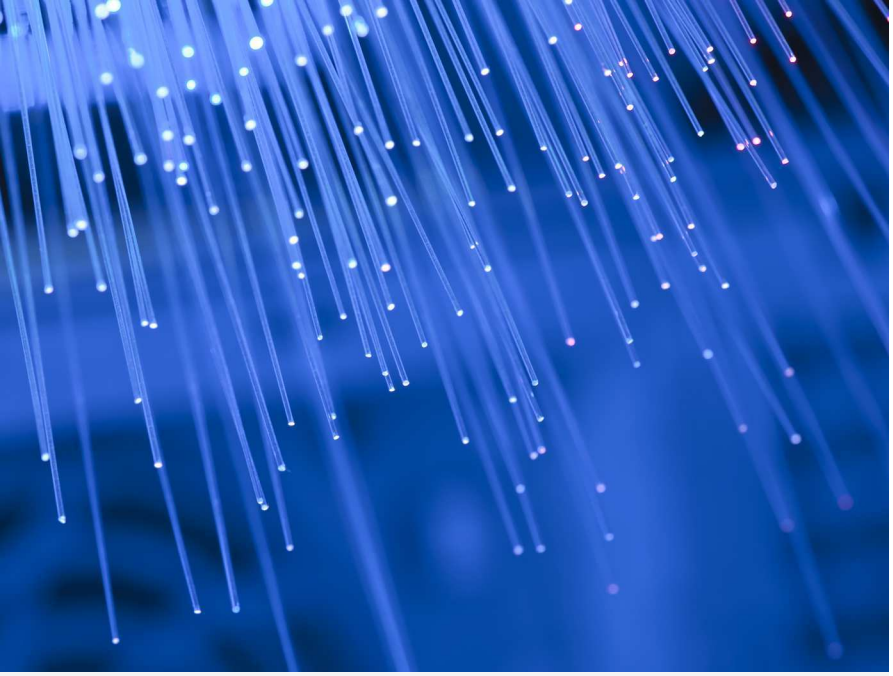

National Aeronautics and
Space Administration

Power Generation and Storage

Optimum Solar Conversion Cell Configurations

Low Cost Optical Fiber Solar Cell Configurations

NASA has invented a new optical fiber that is suitable for solar lighting applications and electrical generation. A key feature is the integration of photovoltaic material for electricity generation. Fiber solar cells surpass both the efficiency and functionality of traditional flat-panel solar cells. A hybrid solar energy cell device manufactured from this new optical fiber consists of three or four layers of materials, including a combination of n-type nanowires and selected p-type polymers. The fiber has two key features which distinguish it from other fibers. First, the amount of visible light transmitted to the lighting application can be varied by tuning the fiber material. Second, photovoltaic material is integrated into the fiber and can be used to generate electricity - from the ultraviolet and infrared portions of the spectrum. If the fiber is tuned to reduce the amount of visible light transmitted to the lighting application, it is also used to generate electricity.

BENEFITS

- Provides lighting and electrical generation
- Light production can be varied
- Low manufacturing costs
- Low operating cost
- No greenhouse gas emissions
- Lightweight and flexible

technology solution

THE TECHNOLOGY

A solar cell manufactured from this new optical fiber has photovoltaic (PV) material integrated into the fiber to enable electricity generation from unused light, including non-visible portions of the spectrum and visible light not transmitted to a lighting application. These new solar cells are based around cylindrical optical fibers, providing two distinct advantages over the flat panels that lead to increased efficiency. The core fiber, used to transmit light, can be adjusted to increase or decrease the amount of available light that is transmitted to the lighting application at any point in real time. This invention can be applied wherever optical concentrators are used to collect and redirect incident light. Wavelengths as large as 780 nanometers (nm) can be used to drive the conversion process. This technology has very low operating costs and environmental impacts (in particular, no greenhouse gas emissions). The fiber uses low-cost polymer materials. It is lightweight and flexible, and can be manufactured using low-cost solution processing techniques. Such multifunctional materials have great potential for the future of solar and photovoltaic devices. They will enable new devices that are small and lightweight that can be used without connection to existing electrical grids.

Optical Fiber with Solar Conversion Media

A Hybrid Optical Fiber Lighting Device and Solar Cell

APPLICATIONS

The technology has several potential applications:

- Solar lighting
- Solar powered devices
- Energy conversion and utilization
- Commercial buildings
- Space missions

PUBLICATIONS

Patent No: 9,033,525

More Information

National Aeronautics and Space Administration

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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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