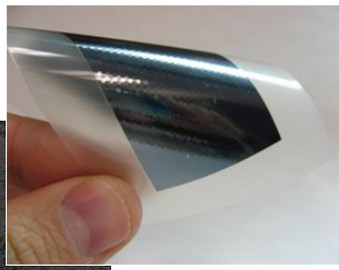
Sandia National Laboratories

Energy, Climate & Infrastructure Security

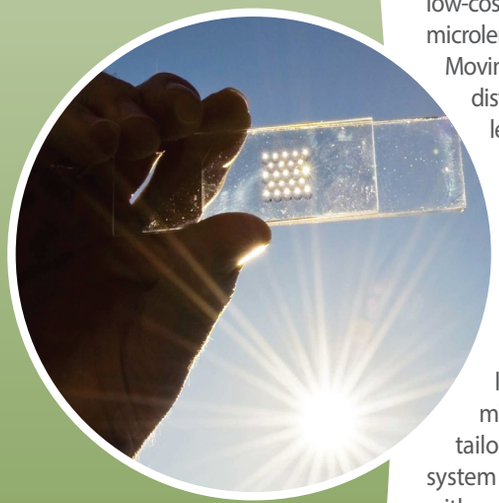
Deploy Clean Energy

Microsystems Enabled Photovoltaics (MEPV) "Solar Glitter"

These tiny glitter-sized photovoltaic (PV) cells could revolutionize solar energy collection. Made from robust semiconductor materials, miniaturized PV generate clean electricity that can work as safely, reliably, and durably as present-day grid power, and be cheaper than all other forms of energy.

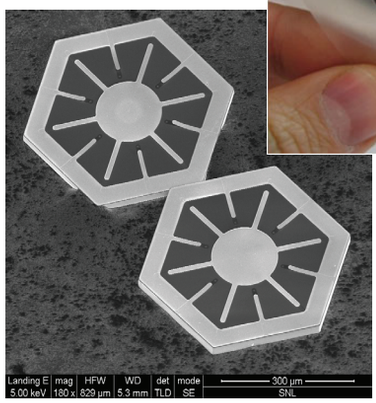


We're taking a completely different approach to photovoltaic systems based on miniaturized PV cells. It's a direction that industry has not yet taken.



Benefits of a Miniaturized Approach

Sandia's microsystems-enabled photovoltaics (MEPV) uses microdesign and microfabrication techniques to produce solar cells as small as 3-20 microns thick and 100-1000 microns wide. These PV cells are then placed or 'printed' onto a low-cost substrate with embedded contacts and microlenses for focusing sunlight onto the cells. Moving to micro-scale PV cell sizes results in distinct benefits at cell, module, and system levels, including reducing the amount of expensive semiconductors by 30 times while still achieving high efficiencies.



Applications

MEPV solar power systems can have impact in both mobile and stationary power applications. At the system level, the large number of individual micro-PV cells can be interconnected to tailor voltage and current output to meet system requirements. The flat panel profile with micro-optical focusing further simplifies sun tracking, reducing both the cost and complexity of the solar concentrating design.

MEPV units can be placed into flexible sheets that could wrap around unusual shapes for solar power integrated into buildings, tents, and maybe even clothing. Rooftop micro-PV modules could have intelligent controls, inverters, and even storage built into the chip—simplifying the grid-integration process.

Put together, glitter-sized photovoltaic cells become the building blocks for generating electricity in a new, efficient, versatile, and inexpensive way—the powering of anything could become as simple as exposing it to light.

R&D Partnerships to Date

As part of our MEPV technology development, we have formed a variety of mutually beneficial partnerships. Our role is to design, fabricate, and test MEPV cells, devices, modules, and systems, while our partners provide MEPV wafers and components, as well as manufacturing tools and techniques. Collaborators include Universal Instruments Corp., Endicott Interconnect Technologies, Inc., Micro Industries, Inc., EMCORE Corp., the National Renewable Energy Laboratory, and the University of South Florida.

Commercialization Path

As Sandia prototypes new solar glitter cells, modules, optics, and components, we seek a select set of private sector partners with complementary capabilities and funding to turn our MEPV prototypes into finished products. The partnership should foster a viable business enterprise capable of manufacturing, marketing, distributing, and selling solar glitter cell products. Our team will leverage resources including people, ideas, and funding, to transfer and support the technical know-how for advancing the technology and developing innovative applications for commercialization. The strategic partnership will support Sandia's mission, customers, and program development.

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U.S. DEPARTMENT OF ENERGY

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