



## Carbon Nanotube Schottky Barrier Photovoltaic Device

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**WARF: P04002US**

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a cost- and energy-efficient photovoltaic cell that uses carbon nanotubes as the photoconducting material.**

### Overview

Photovoltaic cells convert sunlight directly into electricity through the interaction of photons and electrons within a photoconducting material. To create a photovoltaic cell, a photoconducting material such as silicon is joined by electrical contacts to form a junction; then, photons striking the cell dislodge mismatched electrons, creating a current as the electrons move across the junction. Today's photoconducting materials are either expensive or lack efficiency, so that solar cell energy is not competitive with commercial power.

### The Invention

UW-Madison researchers have developed a cost- and energy-efficient photovoltaic cell that uses carbon nanotubes as the photoconducting material. Unlike semiconductor materials, carbon nanotubes absorb different spectra of light depending on the diameter and chirality of each tube. A variety of nanotube sizes and chiralities can be used within a photovoltaic array to significantly increase the efficiency over current technologies.

The invention also includes a novel method of manufacturing the nanotube array. Normally, nanotubes are grown with a catalyst and preserved in a fluid, which the end user must go through several steps to remove. The nanotubes described here can be grown and then directly attached to the array surface.

Because large numbers of nanotubes are needed to generate current efficiently, they are attached in a dense, but random arrangement. After the nanotubes are deposited on the surface, the metallic contacts from which the current is gathered are applied in a uniform grid over the nanotubes.

### Applications

- Photovoltaic cells
- Solar power

### Key Benefits

- Significantly higher efficiency than current technologies
- Relatively inexpensive to manufacture
- Potentially able to compete with commercial sources for generating power
- Carbon nanotubes are flexible and may be placed on a polymer support to reduce production costs
- Avoids the need for expensive silicon processing environments
- Useful to power a variety of devices, including computers, mobile phones, calculators, and watches

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- Useful to generate power in a power grid

## Additional Information

### For More Information About the Inventors

- [Max Lagally](#)

### Tech Fields

- [Clean Technology : Solar, wind & water technologies](#)
- [Materials & Chemicals : Composites](#)

For current licensing status, please contact Jeanine Burmania at [jeanine@warf.org](mailto:jeanine@warf.org) or 608-960-9846

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