

Micro Power Source

Sandia National Laboratories, Front Edge Technology, Inc., Pacific Northwest National Laboratory (PNNL), University of California at Los Angeles (UCLA)

Problem

Everyone has experienced it: The batteries on your electronic device running out at the most inopportune moment. But what if the batteries had the ability to recharge themselves? What if they were covered by a thin photovoltaic (PV) film that could harvest energy from the sun? Just as on rooftops, the PV surface could convert the sunlight to electricity, thereby recharging the battery in the process. Sandia, working with Pacific Northwest National Laboratory (PNNL) and University of California at Los Angeles (UCLA), has developed the Micro Power Source, a system that integrates a lithium-ion-based solid electrolyte battery with an ultra-thin PV cell, producing a self-charging battery.

Innovative Edge

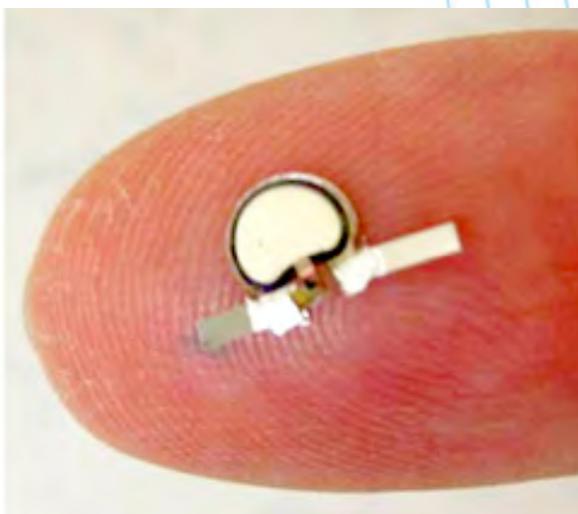
The micro power source is an ultra-small form factor, energy harvesting (self-charging) power source that occupies a volume of only $1 \mu\text{L}$, yet possesses a high peak-power density greater than 1,000 W/L. Resembling a small disk, the entire system is environmentally sealed with a polymer coating and is very small. The battery is a solid-state system employing a lithium phosphorus oxynitride (LiPON) electrolyte and is charged by an energy harvesting PV device.

Originally funded by Defense Advanced Research Projects Agency, the device features Sandia's Microsystems and Engineering Sciences Applications fabricated ultra-thin PV cells; Front Edge Technology's thin film rechargeable lithium cells and masking technique for manufacturing thin film batteries; PNNL's ultra-thin sealing material; and UCLA Nanofabrication Lab's assembly and packaging techniques. The construction of the battery and the PV are based on existing manufacturing technologies that are amenable to volume manufacturing scale-up.

Commercialization & Industry Impact

While DARPA's applications are not available, the micro power source has the potential to revolutionize a number of commercial industries such as handheld electronics, cyber security, and alternative energy.

The micro power source technology lends itself to a number of commercial applications including active smart cards, self-powered radio frequency identification tags, self-powered portable memory devices, in-situ power for industrial process monitors, and remote untethered sensors and transmitters. The system became available in February 2009. While initially available for the above uses, the form factor and energy harvester can be easily changed to open up many other application spaces. Front Edge Technology, Inc. has plans to market this product in the future.



The rechargeable, ultra-small micro power source.