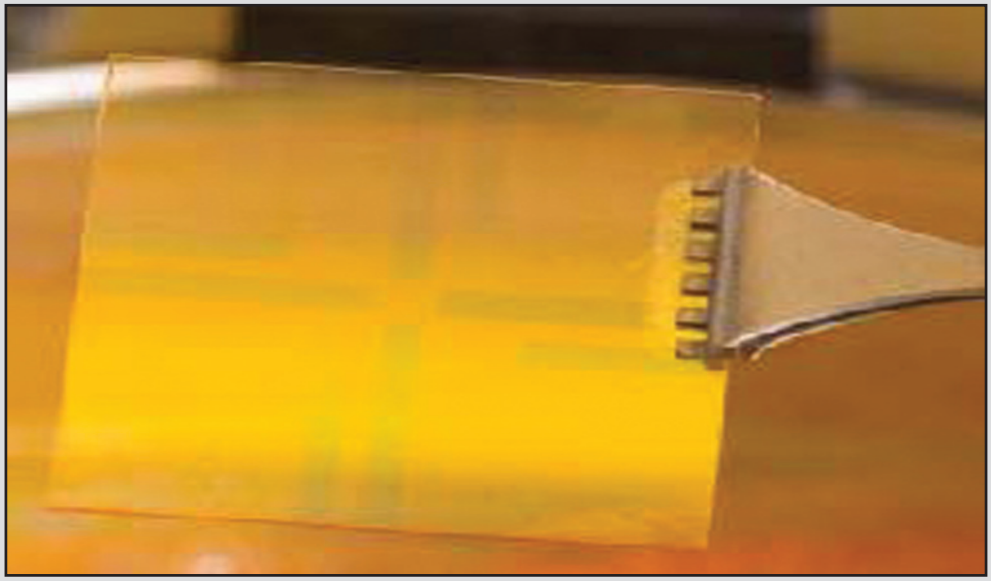
Conductive Ink Energizes Solar Use for Soldiers



Plexcore® technology, depicted here, will enable form-fitted solar cells to power Global Positioning System components and communication devices, as well as thin-film solar panels incorporated into tents. Commercial applications include solar energy batteries for cell phones, radios, and other portable devices.

An AFRL/industry collaboration produced a ready-to-use technology that widens the possible forms of solar energy use in powering navigation/location-finding, communication, and other portable—and in some cases, wearable—devices used by soldiers. Using funds provided by AFRL through congressional contract, the Pennsylvania NanoMaterials Commercialization Center (PNCC) developed a "conductive ink" that enables printing of organic photovoltaic (OPV) solar cell panels on very thin, flexible surfaces, such as those of a tent or an individual soldier's uniform. Using this special ink as a basis, Plextronics, Inc., created Plexcore®, the novel solar cell panel technology that has since won best-in-class recognition for unmatched solar power efficiency. This lab-sponsored research and development (R&D) effort also streamlined the manufacturing process for printed OPV devices, decreasing both costs and production times.

One of Plexcore's important advantages over silicon-based solar cell panels is its substantially reduced cost: about $50/m^2 for Plexcore panels versus $500/m^2 for silicon-based products. Plexcore also lowers production time and energy and, compared to other organic photovoltaic materials, offers world-class efficiency. The material, which is not only flexible but easily made semitransparent, provides the capability to form-fit solar cells to soldiers' uniforms in order to power Global Positioning System components and communication devices. Further, it can be used to print solar panels onto thin films incorporated into tents. Commercial applications include thin solar energy batteries for cell phones, radios, and other portable devices. Continued R&D could lead to expanded applications supporting both the military and the private sector.

The agreement between AFRL and the PNCC requires the development of a technology roadmap identifying technologies for which AFRL has a current need and an interest in funding. It is this agreement that led to the successful R&D program with Plextronics.

Solar power and solid-state lighting offer substantial promise as approaches toward the development of practical alternative energy technology. Combined with the low-cost manufacturing methods of printed electronics, solar and solid-state lighting panels could become economical and environmentally compatible solutions to current-day and future energy challenges. Moreover, military and commercial operations both demand portable, highly efficient power sources. Hence, utilizing the power provided by natural sunlight via solar cells is an attractive option, yet has thus far been restricted by cost and product size constraints. Plextronics' technology, however, represents a significant step forward in printing inexpensive solar cells capable of powering a wide range of portable devices. Key outcomes include significantly lower costs and reduced logistical footprints for military operations across the battlefield environment.