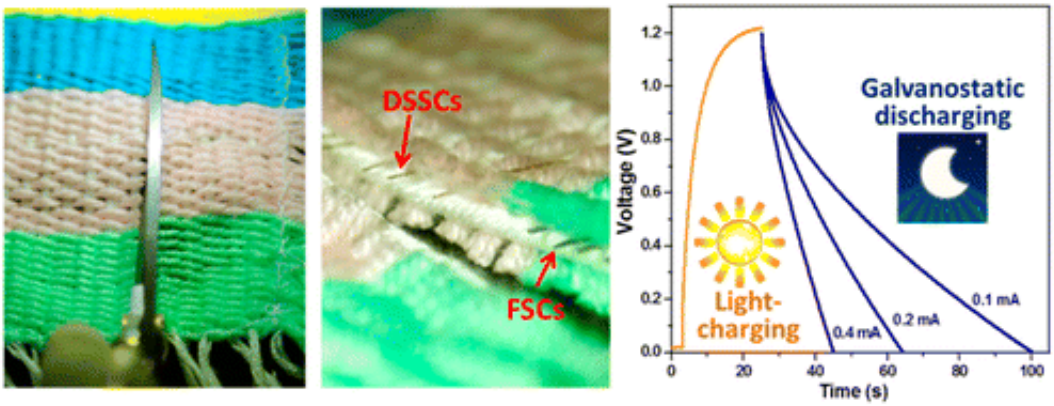
'Smart clothing' could someday power cell phones with the sun's rays

October 5 2016



Credit: American Chemical Society

Batteries in smart phones and other portable electronics often die at inopportune times. Carrying a spare battery is one solution. As an alternative, researchers have tried to create fibers to incorporate in clothing that would power these devices. However, many of these fibers can't withstand clothing manufacturing, especially weaving and cutting.

Now, in the journal *ACS Nano*, scientists report the first fibers suitable for weaving into tailorable textiles that can capture and release solar energy.

To collect solar power, Wenjie Mai, Xing Fan and colleagues created two different types of fibers. One contained titanium or a manganese-

coated polymer along with zinc oxide, a dye and an electrolyte. These fibers were then interlaced with copper-coated polymer wires to create the solar cell section of the textile. To store power, the researchers developed a second type of fiber. This one was made of titanium, titanium nitride, a thin carbon shell to prevent oxidation and an electrolyte. These fibers were woven with cotton yarn.

When combined, the new materials formed a flexible textile that the team could cut and tailor into a "smart garment" that was fully charged by sunlight. The researchers say the clothing could potentially power small electronics including tablets and phones.

More information: Zhisheng Chai et al. Tailorable and Wearable Textile Devices for Solar Energy Harvesting and Simultaneous Storage, *ACS Nano* (2016). DOI: 10.1021/acsnano.6b05293

Abstract
The pursuit of harmonic combination of technology and fashion intrinsically points to the development of smart garments. Herein, we present an all-solid tailorable energy textile possessing integrated function of simultaneous solar energy harvesting and storage, and we call it tailorable textile device. Our technique makes it possible to tailor the multifunctional textile into any designed shape without impairing its performance and produce stylish smart energy garments for wearable self-powering system with enhanced user experience and more room for fashion design. The "threads" (fiber electrodes) featuring tailorability and knittability can be large-scale fabricated and then woven into energy textiles. The fiber supercapacitor with merits of tailorability, ultrafast charging capability, and ultrahigh bending-resistance is used as the energy storage module, while an all-solid dye-sensitized solar cell textile is used as the solar energy harvesting module. Our textile sample can be fully charged to 1.2 V in 17 s by self-harvesting solar energy and fully discharged in 78 s at a discharge current density of 0.1 mA.

Provided by American Chemical Society