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Materials science: Solar cells go round the bend

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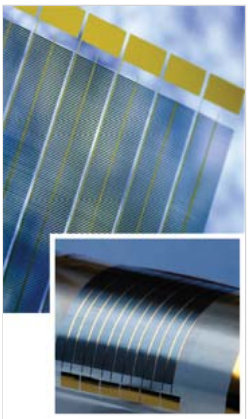

J. YOON *ET AL.*

With high oil prices sparking a surge of interest in alternative energy sources, solar cells have become the subject of intense research. Much of this effort focuses on finding new designs that open up fresh applications. John Rogers and colleagues now report just such a development (J. Yoon *et al.* ***Nature Mater.* doi:10.1038/nmat2287; 2008**) — tiny, ultrathin cells made of silicon that, when fixed in arrays on a flexible substrate, create large, bendy solar cells (pictured).

The authors carve their microcell arrays from a rectangular block of silicon. They begin by etching the outlines of the microcells (the tops and sides) onto the upper surface of the silicon block. They then make electronic junctions and electrical contacts by 'doping' the silicon, adding boron and phosphorus, and using an inert mask to define the regions to be doped. A further round of etching exposes the final three-dimensional shape of the microcells, retaining a thin sliver of silicon to anchor the cells to the block. Finally, the base of the wafer is doped with boron, to yield functioning solar microcells.

To make bendable, large-scale solar cells, Rogers and colleagues use a printing technique. They press a flat stamp onto the arrays of microcells on the silicon block, breaking the anchors that tether them to the silicon. The microcells stick to the soft surface of the stamp, and are transferred to a flexible substrate simply by pressing the stamp onto the substrate. The authors then construct electrodes to connect the microcells to each other, using one of various established methods.

The resulting devices have several desirable properties. First, they are remarkably light, which, along with their flexibility, allows them to be transported and installed more easily than existing solar cells. Second, they work just as efficiently when bent as they do when flat, so they could be fixed to curved or irregular surfaces. Furthermore, they can be made to be transparent, which would allow them to be used on windows. And because the microcells are so thin, less silicon is used, minimizing costs.