Economist.com SCIENCE & TECHNOLOGY

Solar energy

Feeling the heat

Aug 21st 2008
From The Economist print edition

A new sort of solar cell is in the making

INFRA-RED light has not featured high on the list of alternative sources of energy. Solar cells prefer visible, or even ultraviolet radiation. But there is a lot of infra-red in the spectrum, so it seems silly to ignore it. Steven Novack, of the Idaho National Laboratory in America has therefore been looking for ways to capture it—and, as he told a meeting earlier this month in Jacksonville, Florida, held by the American Society of Mechanical Engineers, it looks as though he has found one.

Solar cells work because visible and ultraviolet light are powerful enough to knock electrons free from atoms. The electrons go on to form a useful direct current. Infra-red is not powerful enough to do this. It is, however, powerful enough to set electrons vibrating—particularly those electrons already floating free inside a metallic crystal lattice. Design a structure in which the electrons resonate in a way analogous to a tuning fork and you have a type of generator, since the resonating electrons are, in effect, an alternating current. Indeed, that is how a radio antenna works, except that the weak current generated by the radio waves has to be amplified to do its job of carrying a signal round a radio. Dr Novack, by contrast, proposes to create a current strong enough to be tapped as a source of power.

He and his colleagues designed their infra-red antennae using data they collected while studying how metals behave when exposed to infra-red rays. They tweaked the composition, shape and size of the antennae until they arrived at spiral structures a few nanometres (billionths of a metre) across. The key to commercialising this idea is that such antennae can be stamped by the billion on to plastic sheets. The stamps themselves are made by etching silicon wafers using the technique that makes microprocessors, and the sheets can be shaped to coat anything from cars to portable electronic devices.

The remaining hurdle, admittedly a high one, is to collect the current from the antennae. The usual way to do this would be to use a rectifier—a device that converts alternating to direct current. However, the current in the nanoantennae oscillates at a rate of trillions of cycles a second, which is beyond the range of existing rectifiers. What is needed are smaller rectifiers which would, by very dint of their size, rectify current of an appropriate frequency.

If that could be done, a new type of solar cell would be available. And not just solar. All hot objects give off infra-red. If you put such a cell next to, say, an engine's exhaust pipe, you would have the ultimate form of recycling.