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News in Science - Nanowire generates its own spark - 18/10/2007

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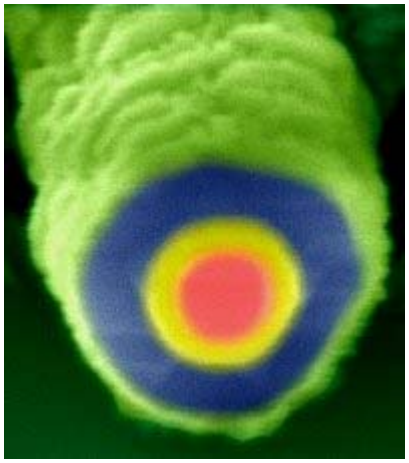
Nanowire generates its own spark

Agen鐩 France-Presse Thursday,?8燱ctober?

Scientists have developed solar cells 200 hundred times thinner than a human hair that they believe will power the nanoscale gadgetry of tomorrow.

Professor Charles Lieber and colleagues at Harvard University have made silicon nanowire that can generate its own energy by converting light into electrical energy.

They publish their results today in the journal *Nature*.



This nanowire converts light into electrical energy *(Image: B Tian, Lieber Group, Harvard University)*

Nanoscale gadgets, from consumer devices to bioterrorism monitors and in-body diagnostics, often need a power source.

But finding something that doesn't degrade or is efficient enough has been difficult.

The researchers have made nanowire that's virtually invisible to the naked eye, a single strand of which can crank out up to 200 picowatts, or two hundred billionths of a watt.

That may not seem much. But at the nanoscale it is enough to provide a steady output of electricity to run ultra-low power electronics, including some that could be

worn on, or even inside, the body.

The scientists say it is also clean, efficient and renewable.

"An individual nanoelectonic device will indeed consume very little power. But to do something interesting will require many interconnected devices and thus the power requirement, even for nanosystems, can be a challenge," Lieber says.

Monitoring bioterrorism threats, for example, would require an entire array of nanosensors, nanoprocessors to analyse the signals received, and nanotransmitters to relay information to a centralised facility, he says.

Conventional sources, he adds, are "bulky, non-renewable and expensive" by comparison.

Layers and layers

The cable itself looks, at first sight, like the cables used to hook up cable television networks. Both have a core covered with two layers.

But the similarity stops there. Besides being 100,000 times smaller, the nanowire is not made of metal but of silicon with three different types of conductivity arranged as layered shells.

Incoming light generates electrons in the outer shell, which are then swept into the second layer and the inner core along micropores.

These holes carry an equal, but opposite, charge as electrons, which means that the two particles move in opposite directions in the presence of an electric field.

Lieber says the electrically connected core and cladding, a kind of sheath, play the same role as the positive and negative terminals of a battery.

The researchers say that their nanowire converts 3.4% of sunlight into electricity and can withstand concentrated light without deteriorating.

They say it costs about the same to make as other nanoscale photovoltaic devices

and is up to 5% efficient.

Commercial solar cells, by comparison, have efficiencies around 20%, the researchers say.

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