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Hybrid nano-wires provide link to silicon

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Nanoscale electronic components that could be plugged into conventional computer circuits have been developed for the first time by US chemists.

Nanoscopic electronic wires have already been made in the laboratory, often using exotic materials such as carbon nanotubes. However, to be of practical use, such components will need to be connected to larger electronic components. And existing electronics are usually made with silicon, which cannot easily be connected to nanotubes.

But now, Charles Lieber and colleagues at Harvard University in Cambridge, Massachusetts, have developed highly conductive nanowires by blending silicon and nickel together. These could provide a way to connect nanoscale components with existing electronic components, which are hundreds or thousands of times larger.

A huge amount of research is being done on nanoscale electronics, because such miniaturization would enable computer makers to pack in far more processing power.

High conductivity

Lieber's group coated tiny silicon wires measuring 20 nanometres in diameter with the metal nickel before heating them to 550°C to blend the two elements together. After etching away excess metal, they then tested the electronic properties of the resulting nickel silicide wires.

They were found to have an extremely high conductivity, making them very promising for use as electronic components. Furthermore, by coating only part of the wire, the process could be used to make wires that were part silicon and part nickel-silicon, providing a way to interface with existing silicon electronics.

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"I find this result quite amazing," says Silvano De Franceschi of Delft University of Technology in the Netherlands. "It implies that such heterostructures could be shrunk down to the nanometre scale. This is relevant for the high-scale integration of electronic circuits."

The Harvard researchers have also shown that the method can be used to create simple nanoscale electronic components, e.g. field-effect transistors. "By extending our approach to crossed nanowires it should become possible to assemble large and dense arrays ... of transistors and other devices that could enable hybrid integrated circuits," the team writes in *Nature*.

But De Fanseschi notes that significant obstacles still need to be overcome before chemically created nanowires can be used as an alternative, or a complement, to existing technology. "A major challenge is to devise effective techniques to control their position to a sufficient degree of accuracy," he says.

Journal reference: *Nature* (vol 430, p 61)

Will Knight

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