21 Feb 2008
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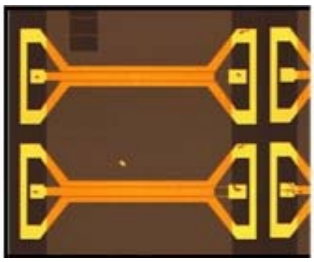
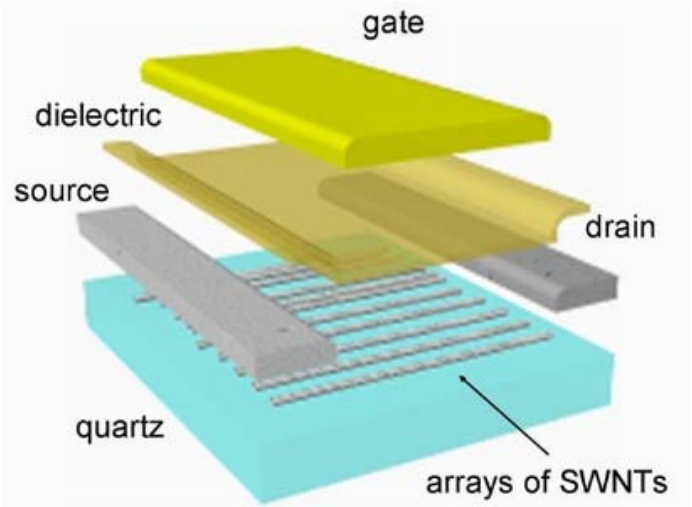
Country: United States

Carbon nanotubes have a sound future in the electronics industry



Once again transistor radios made from carbon nanotubes make the news. Nanotube devices and circuits are now possible, thanks to a novel growth technique developed by researchers at the University of Illinois, Lehigh and Purdue universities in the US.

"These results indicate that nanotubes might have an important role to play in high-speed analog electronics, where benchmarking studies against silicon indicate significant advantages in comparably scaled devices, together with capabilities that might complement compound semiconductors," said Rogers, a Founder Professor of Materials Science and Engineering at the University of Illinois.



Schematic exploded view of a radio-frequency transistor that uses parallel, aligned arrays of carbon nanotubes for the semiconductor.

The growth technique produces linear, horizontally aligned arrays of hundreds of thousands of carbon nanotubes that function collectively as a thin-film semiconductor material in which charge moves independently through each of the nanotubes. The arrays

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can be integrated into electronic devices and circuits by conventional chip-processing techniques.

"The ability to grow these densely packed horizontal arrays of nanotubes to produce high current outputs, and the ability to manufacture the arrays reliably and in large quantities, allows us to build circuits and transistors with high performance," Rogers said.

Rogers and collaborators at the University of Illinois and Northrop Grumman a defense and technology company, fabricated nanotube transistor radios, in which nanotube devices provided all of the key functions. The radios were based on a heterodyne receiver design consisting of four capacitively coupled stages: an active resonant antenna, two radio-frequency amplifiers, and an audio amplifier, all based on nanotube devices. Headphones plugged directly into the output of a nanotube transistor. In all, seven nanotube transistors were incorporated into the design of each radio.

The researchers were able to tune one of the nanotube-transistor radios to WBAL-AM (1090) in Baltimore, to pick up a traffic report during one of the tests.

"We were not trying to make the world's tiniest radios," Rogers said. *"The nanotube radios are a demonstration, an important milestone toward building the technology into a form that ultimately would be commercially competitive with entrenched approaches."*

A team of researchers with the US Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) claim to have made the smallest radio ever made from a single carbon nanotube. Read an earlier article on PEW called Berkeley Lab, USA create the smallest radio ever made.

A paper on the nanotube-transistor radios, by Rogers and engineers at Northrop Grumman is available in the Proceedings of the National Academy of Sciences.

Reference and source of images: University of Illinois

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