Hindustan Times

March 26, 2007 Monday 2:34 PM EST

LENGTH: 404 words

HEADLINE: Linear nano-tubes key to high-performance electronics: Study

BYLINE: Report from the Asian News International brought to you by the Hindustan Times

DATELINE: Washington

BODY:

Washington, March 26 -- Researchers at the **Universities of Illinois,** Lehigh and Purdue have opined that linear nano-tubes hold the key to the integration of electronic devices.

John A. Rogers, a Founder Professor of Materials Science and Engineering at the **University of Illinois,** and one of the authors of the study, claimed that nano-tube arrays can be transferred to plastic and other unusual substrates for applications such as flexible displays, structural health monitors and heads-up displays.

The arrays also can be used to enhance the performance of devices built with conventional silicon-based chip technology, he added.

"The aligned arrays represent an important step toward large-scale integrated nano-tube electronics," Rogers says in his paper published in the journal Nature Nano-technology.

To create the nano-tube arrays, the researchers began with a wafer of single-crystal quartz, on which they deposited thin strips of iron nano-particles. The iron, they claimed acts as a catalyst for the growth of carbon nano-tubes by chemical vapour deposition. As the nano-tubes grow past the iron strips, they lock onto the quartz crystal, which then aligns their growth.

The resulting linear arrays consist of hundreds of thousands of nano-tubes, each approximately 1 nanometer in diameter (a nanometer is 1 billionth of a meter), and up to 300 microns in length (a micron is 1 millionth of a meter). The nano-tubes are spaced approximately 100 nanometers apart.

The arrays function as an effective thin-film semiconductor material in which charge moves independently through each of the nano-tubes. In this configuration, the nano-tubes can be integrated into electronic devices in a straightforward fashion by conventional chip-processing techniques.

A typical device incorporates approximately 1,000 nano-tubes, and can produce current outputs 1,000 times higher than those of previously reported devices that incorporate just a single nano-tube.

Using the arrays, the researchers built and tested a number of transistors and logic gates, and compared the properties of nano-tube arrays with those of individual nanotubes.

"This is the first study that shows properties in scalable device configurations that approach the intrinsic

properties of the tubes themselves, as inferred from single-tube studies," said Rogers.

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