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RAPID ASSEMBLY

Method forms ordered, nanosized circuit elements on multiple length scales

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A solution-based method for assembling nanowire structures from the bottom up with spatial control on several length scales, ranging from nanometers to centimeters, has been demonstrated by scientists at Harvard University. Researchers there have shown that large numbers of uniform and hierarchically ordered nanoscale circuit elements can be prepared simultaneously using a simple and adaptable technique.

Driven by potential benefits of ultra-high-density microelectronics, researchers have developed and studied various test devices, such as field-effect transistors and light-emitting diodes, that are based on nanometer-scale components. Although the studies have advanced the field toward the sophisticated logic and memory circuitry, in general, the tiny devices have been assembled one at a time because of the limitations of available fabrication methods.

Now, Harvard chemistry professor Charles M. Lieber and coworkers Dongmok Whang, Song Jin, and Yue Wu have shown that numerous basic circuit components can be constructed simultaneously using a straightforward procedure that controls the positions of nanowires or other building blocks and the devices constructed from them on multiple length scales [*Nano Lett.*, published online Aug. 5, http://dx.doi.org/10.1021/nl0345062].

In one demonstration, the Harvard group prepared ordered films of silicon nanowires using the Langmuir-Blodgett method, which provides control over the nanowire spacings on a length scale ranging from nanometers to micrometers. Then the team used layer-by-layer deposition methods and photolithography to construct arrays of crossed nanowire junctions, which serve as functional circuit components, forming a regular pattern across an area of several square centimeters.

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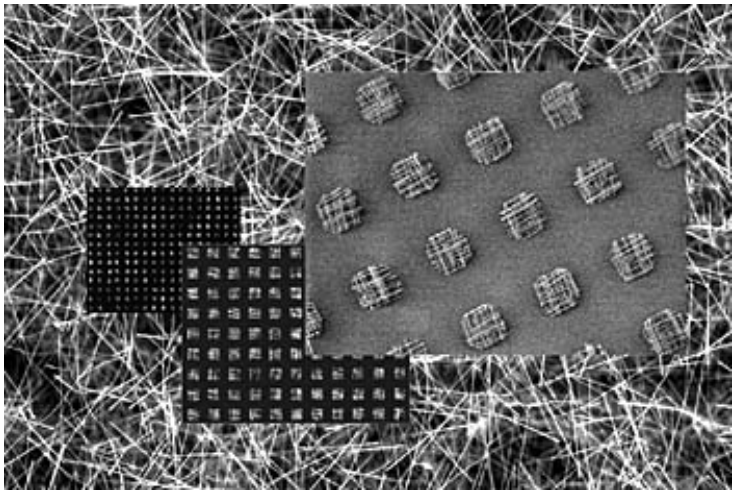

ORDERLY **Randomly oriented silicon nanowires (background) can be organized into centimeter-sized patterns of crossed nanowire arrays (10 µm x 10 µm in the large inset).**
Courtesy of Harvard University

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