Cheaper, Faster Electronics

Researchers at Harvard University (Cambridge, Mass.) have demonstrated that they can easily apply a film of high-performance silicon nanowires to glass and plastic.

The relatively high temperature required to grow high-quality nanowires has limited the quality of electronics on plastics, which melt at such temperatures. However, a "bottom-up" approach that involves the assembly of preformed nanoscale building blocks into functional devices, enabled the team to apply a film of nanowires to glass or plastic long after growth, and do so at room temperature.

Using a liquid solution of the silicon nanowires, they deposited the silicon onto glass and plastic surfaces—similar to applying the ink of a laser printer to a piece of paper. They also showed that nanowires applied to plastic can be bent or deformed into various shapes without hurting performance. (Contact: Charles M. Lieber, E-mail cml@cmliris.harvard.edu)

Maryland Teams with NIST

NIST and the University of Maryland (College Park) are collaborating on nanomanufacturing research. While researchers perform studies at both university and NIST laboratories, tentative plans have been made to build a shared location somewhere on campus. University researchers also will be welcome to work at NIST's Advanced Measurement Lab when it opens this year at Gaithersburg, Md. (Contact: Rae Grad, E-mail rgrad@umd.edu)

Hong Kong Research Institute

The Institute of NanoMaterials and NanoTechnology (INMT) has been established at Hong Kong University of Science & Technology (HKUST). The HK$100 million INMT was established with government and industry support to achieve critical mid-stream R&D and technology transfers relevant to the economic growth of Hong Kong.

INMT already has succeeded in transforming nanotechnology into reality with the creation of nanocatalysts to improve indoor air quality. Capable of decontaminating pollutants like carbon monoxide and organic compounds at low temperatures, the nanocatalysts can be integrated into air-conditioners and dehumidifiers at low cost.

Other potential products and processes in the pipeline include eco-friendly micro-fuel cells, nanoelectronic displays and integrated manufacturing technologies. (Contact: Paul Chu, E-mail cwchu@ust.hk)

Pure Nanotube Fibers

Researchers at Rice University (Houston) believe they have overcome the major hurdle to industrial production of macroscale single-walled carbon nanotube objects—finding a way to store large amounts of nanotubes in liquid form.

The process, which is similar to the one used to make Kevlar®, offers the first real hope of making threads, cables and sheets of pure carbon nanotubes. By dissolving nanotubes in strong sulfuric acid, they achieved solutions containing up to 10% by weight of pure carbon nanotubes—more than 10 times the highest concentrations previously achieved.

This processing route uses no polymeric additives or detergents, which are known to be obstacles to commercial scalability and final product purity. As the concentration increases, the nanotubes first align themselves into spaghetti-like strands and, eventually, form tightly packed liquid crystals that can be processed into pure fibers.

Scientists estimate nanotubes to be 100 times stronger than steel at one-sixth the weight. Kevlar—the fiber used in bulletproof body armor—is about five times stronger than an equal weight of steel. (Contact: Matteo Pasquali, E-mail mp@rice.edu)

Self-assembling DNA Molecules

Scientists at Duke University (Durham, N.C.) have used self-assembling DNA molecules as molecular building blocks, called "tiles," to construct protein-bearing nanoscaffolds and silver nanowires. This could lead to programmable molecular-scale sensors or electronic circuitry.

The goal is to use DNA self-assembly to precisely control the location of other molecules. According to the researchers, their work in DNA computation shows that the tiles' self assembly into structures can be programmed and the tile itself is easy to modify by changing strands.

They used a two-step chemical procedure to coat silver onto the DNA nanoribbons to produce electrically conducting nanowires, then deposited nanoscale metal connecting leads using electron beam lithography. (Contact: Monte Basgall, E-mail monte.basgall@duke.edu)

Faster, Smaller Transistors

Motorola Labs (Tempe, Ariz.) is exploring ways to improve control in the growth of carbon nanotubes (CNTs) that can make transistors smaller and faster, and chemical/biological detectors ultrasensitive.

The team has developed a technique using chemical vapor deposition that can position individual single-walled CNTs at predetermined locations on a substrate in a highly parallel manner that is compatible with conventional semiconductor processing techniques. Furthermore, nearly 90% of these nanotubes are semiconducting in nature. Such results provide an important step forward in developing arrays of ultra-small transistors. (Contact: Margot Brown, E-mail margot.brown@motorola.com)