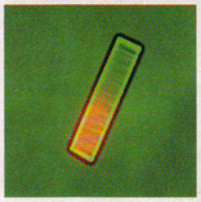
MICROFLUIDICS

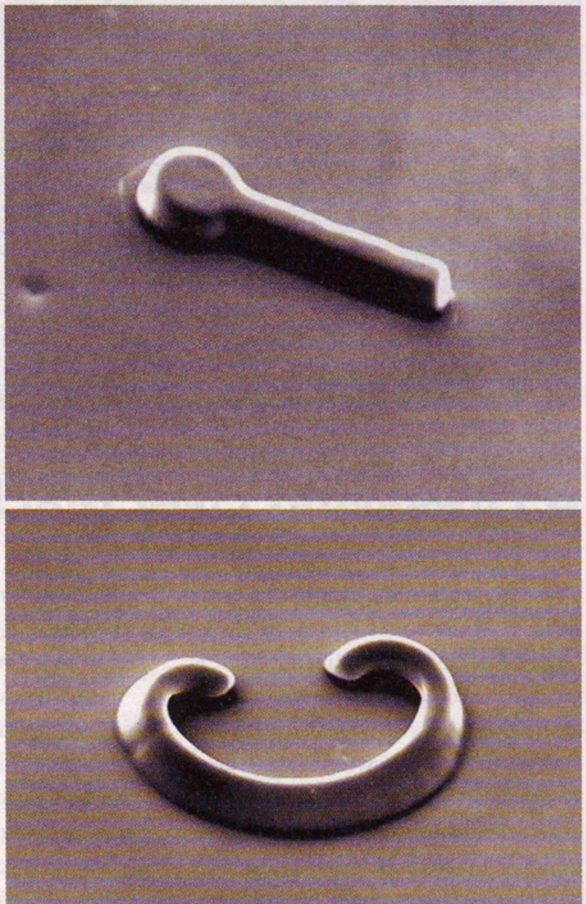
Printing Press for Biosensors

Biologists have long sought a cheap way to simultaneously detect different types of biological molecules in a sample, such as the several malarial proteins that might be present in a patient's blood. One approach uses polymer tags with bar code–like lines that glow different colors when receptors on the tags bind to specific molecules. But making such tags on a large scale has been prohibitively expensive, as each extra bar line adds another step to the manufacturing process.

Now a group of MIT researchers has created a microfluidic printing press that can produce tiny particles in a single step. In addition to biotags, the method can turn out all kinds of shapes—from keys to cylinders to swirls—that could be used to make everything from microelectromechanical machines to optical devices, fabrics, and even the miniature stirring bars and valves used in microfluidics. "This is a beautiful piece of work for continuous synthesis of particles, with great flexibility in the shapes that can be produced," says Howard Stone, a professor of engineering at Harvard University.



The process, developed by an MIT group led by chemical engineer Patrick Doyle, begins with one or several closely spaced, parallel, 100-micrometer-scale streams of liquid. The liquids contain the polymers' precursors, some of which may be bound to proteins that can serve as receptors on a biotag. A flash of ultraviolet light projected through a stencil causes the polymers to solidify in specific shapes. The resulting particles can have several "stripes"—each created from a separate stream of fluid. **KATHERINE BOURZAC**



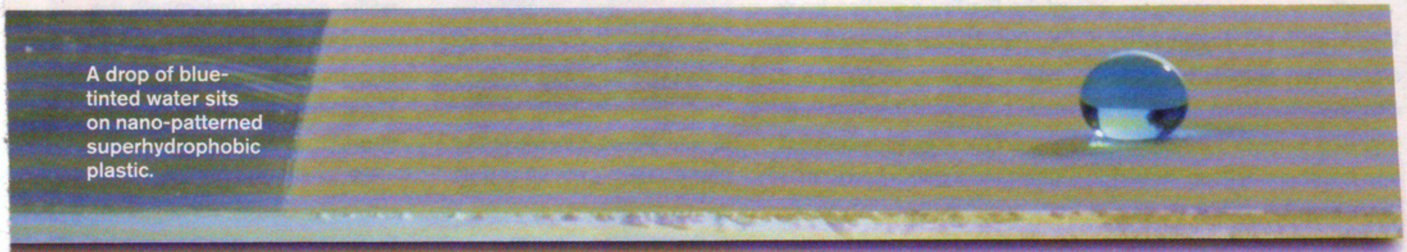
A new microfluidic polymer "printer" can cheaply make 50-micrometer fluorescing bar-coded particles (left) or custom shapes (top and bottom) for other applications.

COURTESY OF DOYLE LABS (BIOSENSORS); COURTESY OF GE (PLASTIC)

MATERIALS

Super Plastic

How would you like a self-washing car or a ketchup bottle whose contents flow freely? Researchers at General Electric have come up with a way to process a common polymer so that it repels fluid so effectively that even honey rolls right off it. The resulting property is called superhydrophobicity. While the property has long been achieved in expensive materials, GE's feat was to make it available in a common polycarbonate, Lexan. The discovery could allow everything from new, easy-to-clean building materials to cheap diagnostic devices with plastic microfluidic channels. In designing the material, GE took inspiration from the leaves of the lotus plant, whose surface cells are five to ten micrometers wide and topped by tiny wax crystals that are tens of nanometers wide. On a lotus leaf, water beads look like almost perfect spheres. GE mimicked this pattern on Lexan by "roughening" its surface in a similar way. Tao Deng, a materials scientist at GE, is tight lipped about the process but says it uses a "chemical treatment of the surface." GE estimates it will take at least five years to commercialize the technology, once all manufacturing issues are resolved. **DAVID TALBOT**



A drop of blue-tinted water sits on nano-patterned superhydrophobic plastic.