LATEST NEWS

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MICROFABRICATION

Tiny Devices Get A Grip

Tetherless grippers grab and move wee objects

Celia Henry Arnaud

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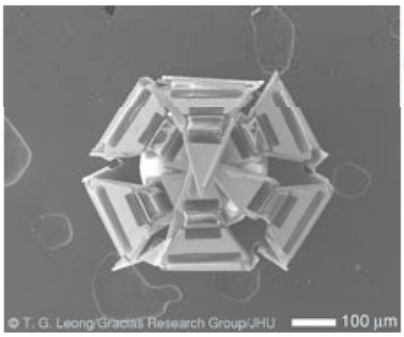
With a clever design based on human hands, researchers from Johns Hopkins University have made tiny "grippers" that are good for grabbing and moving microscale objects, including biological cells. The scientists described their work on Aug. 17 at the American Chemical Society national meeting in Philadelphia.



Courtesy of Timothy Leong/JHU

The tetherless gripper grabs a microbead

Physicians already use precision grippers to obtain tissue samples in medical procedures such as endoscopy and laparoscopy, said David H. Gracias, assistant professor of chemical and biomolecular engineering. Current devices, however, are tethered and difficult to maneuver in tight spaces.

Gracias and his team have now developed tetherless grippers. The required mobility is hard to achieve, Gracias said, because most previous devices are actuated by electricity, which requires the use of wires or batteries. Gracias and his coworkers have instead focused on exploiting benign cues to such as temperature or biomolecules to trigger gripping and release motions.

Gracias and his coworkers designed their devices to mimic human hands, which have rigid phalanges and flexible joints. The grippers' trilayer structure consists of a film made of chromium and copper layers topped with a polymer.

"The film is like a stretched rubber band," Gracias said. "When you release it, it immediately tries to curl up."

The polymer controls whether the film curls up. If the polymer is stiff, the gripper stays open. When the polymer is softened by means of temperature or chemical triggers, the gripper closes around its target like fingers around a ball. The grippers can release their cargo by, for example, applying another chemical that reopens them.

Magnetic portions incorporated into the grippers allow the researchers to guide the devices through tight spaces by using magnets. The next step, Gracias said, is to make them autonomous by guiding them with chemical cues in the body rather than an external magnet.

Gracias reported several applications of the grippers. He used them to capture some cells from a mass of them in a tube. The captured cells remained viable, he noted. He has also used the grippers to perform an in vitro biopsy on a cow's bladder.

VIDEOS

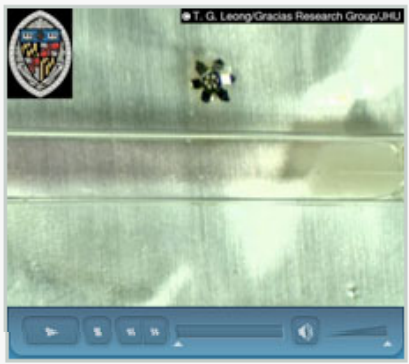
The tetherless gripper, manipulated by external magnets, picks up a specific bead (red).

Courtesy of Timothy Leong/JHU

LAUNCH VIDEO

* Macromedia Flash Player 8 is required to view video.

The gripper grabs cells from a cell mass in a tube.



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