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Laser-activated moving polymers mimic action of muscles

11/9/2000 Polymer gels have been investigated as potential artificial muscles, since they can change shape when exposed to outside stimuli. But these stimuli – typically changes in temperature, pH or solvent composition – act too slowly to be effective. Now, researchers in Japan have found a way to instantaneously change the shape of polymer gels with laser light. Their discovery could make such gels useful in actuators or sensors.

In a report published in the November 9 issue of *Nature*, Hiroaki Misawa and colleagues at the University of Tokushima, Japan, describe the effect of a focused laser beam on the center of an experimental cylinder made of a polymer-water gel based on N-isopropylacrylamide. The beam excites polymer molecules locally, causing functional groups on nearby molecules to temporarily attract each other; this causes the polymer gel to shrink at the point where the beam is focused. Relaxing the beam releases these attractive forces and the gel returns to its original size. In a series of experiments reported in their paper, the researchers demonstrate that the shrinkage of the polymer is not related to heating of the water in the gel; instead, it occurs because of laser-induced phase transitions.

Gel shrinkage occurs up to several tens of microns away from the irradiation spot, the authors of the *Nature* paper report. So by combining the polymer gels and laser light, they conclude, it should be possible to construct useful moving devices that mimic the action of biological muscles. Implanted medical devices and new types of sensors are potential applications of the new technology, they note.

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