



## TECHNOLOGY

# Hybrid Polymer Hydrogels with Regions of Distinct Properties

## OVERVIEW

### Background

Polymer hydrogels are three-dimensional networks of polymer chains cross-linked by chemical or physical bonds and swollen in water. Typical hydrogel formulations involve a monomer and crosslinker polymerized in water, and the properties of the resulting hydrogels can be tailored by altering the monomer or crosslinker formulation. However, when combining more than one monomer, the resulting gels do not retain the properties of the original materials. An alternative way of engineering new gels is to combine multiple gel components into a single material while still retaining the unique features of each component. This method has limitations as it is only suited to patterning in two dimensions and also that the components do not remain fully separated.

### Innovative Technology

University of Maryland researchers have developed a new approach for combining dissimilar gels into one whole material while fully preserving the unique character of each individual gel. The key to our approach is that we bring dissimilar pre-gel mixtures into contact when their viscosities are sufficiently high and thereafter polymerize the hybrid. The high viscosities eliminate convective mixing and slow down diffusive mixing at gel/gel interfaces. Our approach allows the two individual gel components to be spatially juxtaposed in a desired fashion in the hybrid gel. The final gel visually appears as a single, homogeneous, transparent material. Interfaces between the component gels in the hybrid are smooth, i.e., not apparent on visual inspection; moreover, the interfaces are highly robust, and mechanical failure does not occur at these locations.

### Advantages:

- Hybrid gels with distinct properties in different zones
- Robust mechanical interfaces between zones
- Same gel can have unique combination of properties

### Applications:

- Biomaterials
- Tissue scaffolds
- Embedding secret "message" in a gel
- Sensors

## CONTACT INFO

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## Additional Information

## INSTITUTION

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## **CATEGORIES**

- Biomaterials

## **EXTERNAL RESOURCES**

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