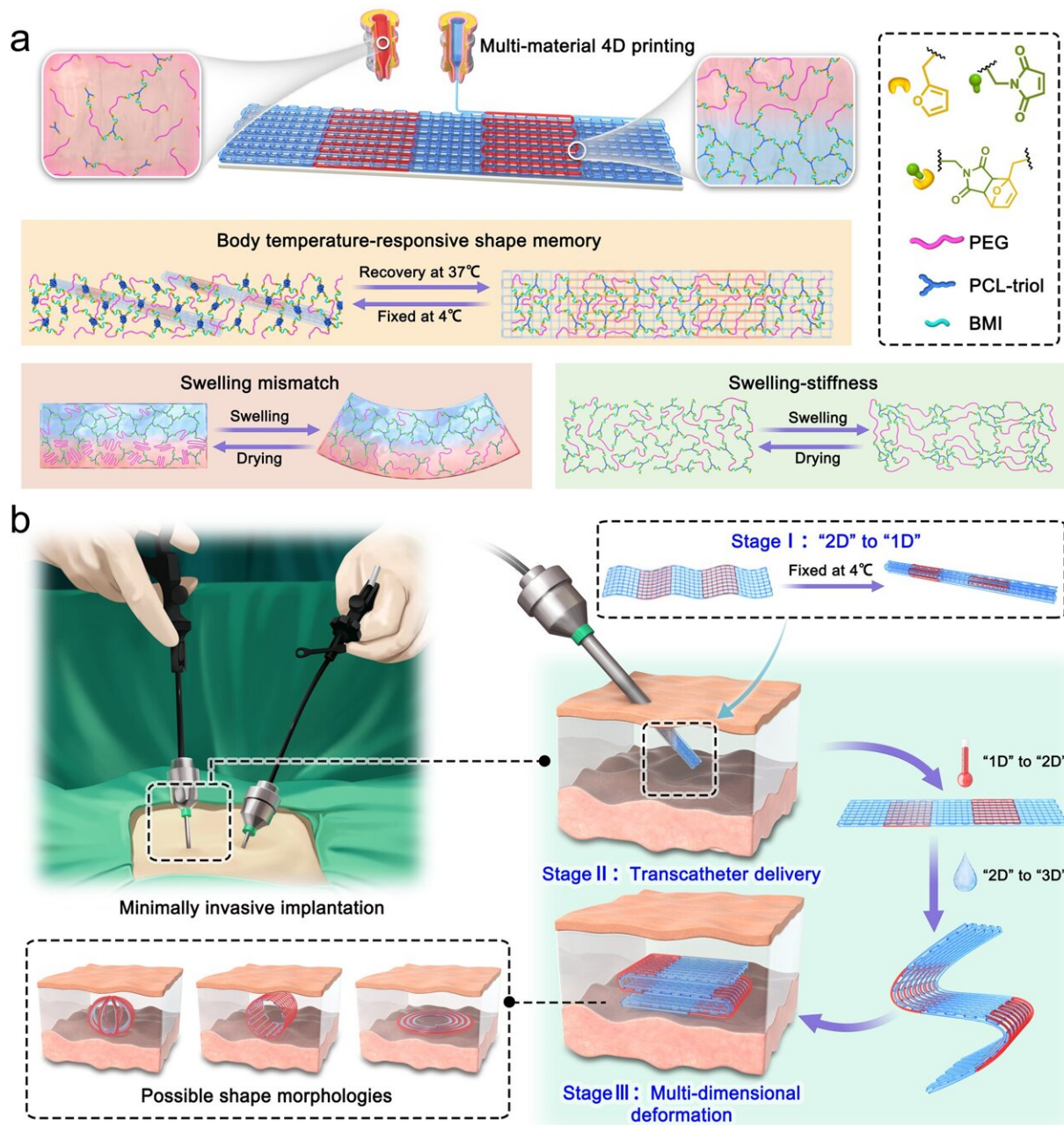


Researchers develop minimally invasive scaffold delivery system using dynamic thermoset polyurethane

May 28 2024



Design and application of 4D printed scaffold. Credit: *Nature Communications* (2024). DOI: 10.1038/s41467-024-45938-0

Recently, researchers have developed an approach to deliver scaffolds in a minimally invasive manner through multidimensional morphing (one-

dimensional to three-dimensional) by developing amphiphilic dynamic thermoset polyurethane (DTPU).

This study was [published](#) in *Nature Communications* on Feb 21. The research team is from the Shenzhen Institute of Advanced Technology (SIAT) of the Chinese Academy of Science.

Three-dimensional (3D) printing is widely used in the biomedical field and has shown promising results in various biomedical applications. However, the insertion of bulky 3D-printed scaffolds often entails exposing the operation site to unavoidable injury.

"Given the growing preference for [minimally invasive surgery](#) in [clinical practice](#), delivering 3D-printed scaffolds in a compact state and allowing them to autonomously morph in vivo to fit the implantation site would be advantageous," said Prof. Zhao Xiaoli, one of the corresponding authors of this study.

In this study, researchers developed a mechanically tunable and dynamically crosslinked shape memory polyurethane system, which is compatible with extrusion-based multi-material 4D printing to fabricate scaffolds with body temperature-triggered shape memory function, water-triggered programmable deformation, and swelling-stiffening properties.

In vitro and in vivo experiments demonstrated that the two-dimensional (2D) printed structure could be constrained into a one-dimensional (1D) shape for catheter delivery. Once implanted in the body, it transformed spontaneously into the desired 3D shape for cavity filling and mechanical support under the stimulation of body temperature and body fluids while circumventing harmful stimuli.

This study presents a novel and promising approach for the minimally

invasive treatment of tissue defects, which shows potential in biomedical applications.

More information: Bo Liu et al, 4D printed hydrogel scaffold with swelling-stiffening properties and programmable deformation for minimally invasive implantation, *Nature Communications* (2024). [DOI: 10.1038/s41467-024-45938-0](https://doi.org/10.1038/s41467-024-45938-0)

Provided by Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences

Citation: Researchers develop minimally invasive scaffold delivery system using dynamic thermoset polyurethane (2024, May 28) retrieved 17 July 2024 from <https://medicalxpress.com/news/2024-05-minimally-invasive-scaffold-delivery-dynamic.html>

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