

ADVANCED FUNCTIONAL MATERIALS

Supporting Information

for *Adv. Funct. Mater.*, DOI: 10.1002/adfm.201903181

Transformable, Freestanding 3D Mesostructures Based on
Transient Materials and Mechanical Interlocking

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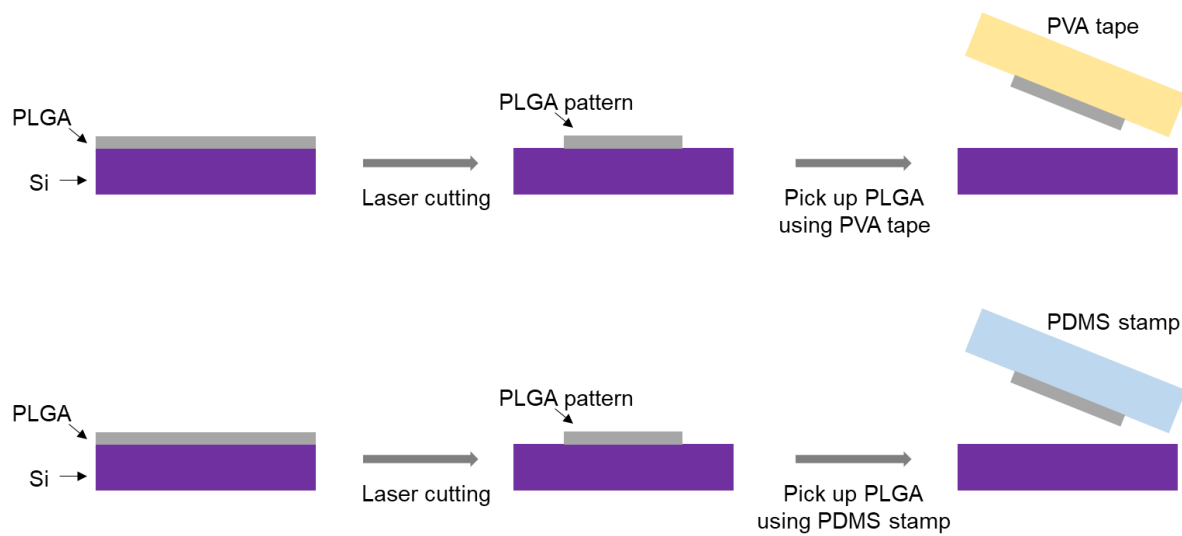


Figure S1. Schematic illustration of steps for preparation of patterned PLGA and transfer to PVA tape and a PDMS stamp.

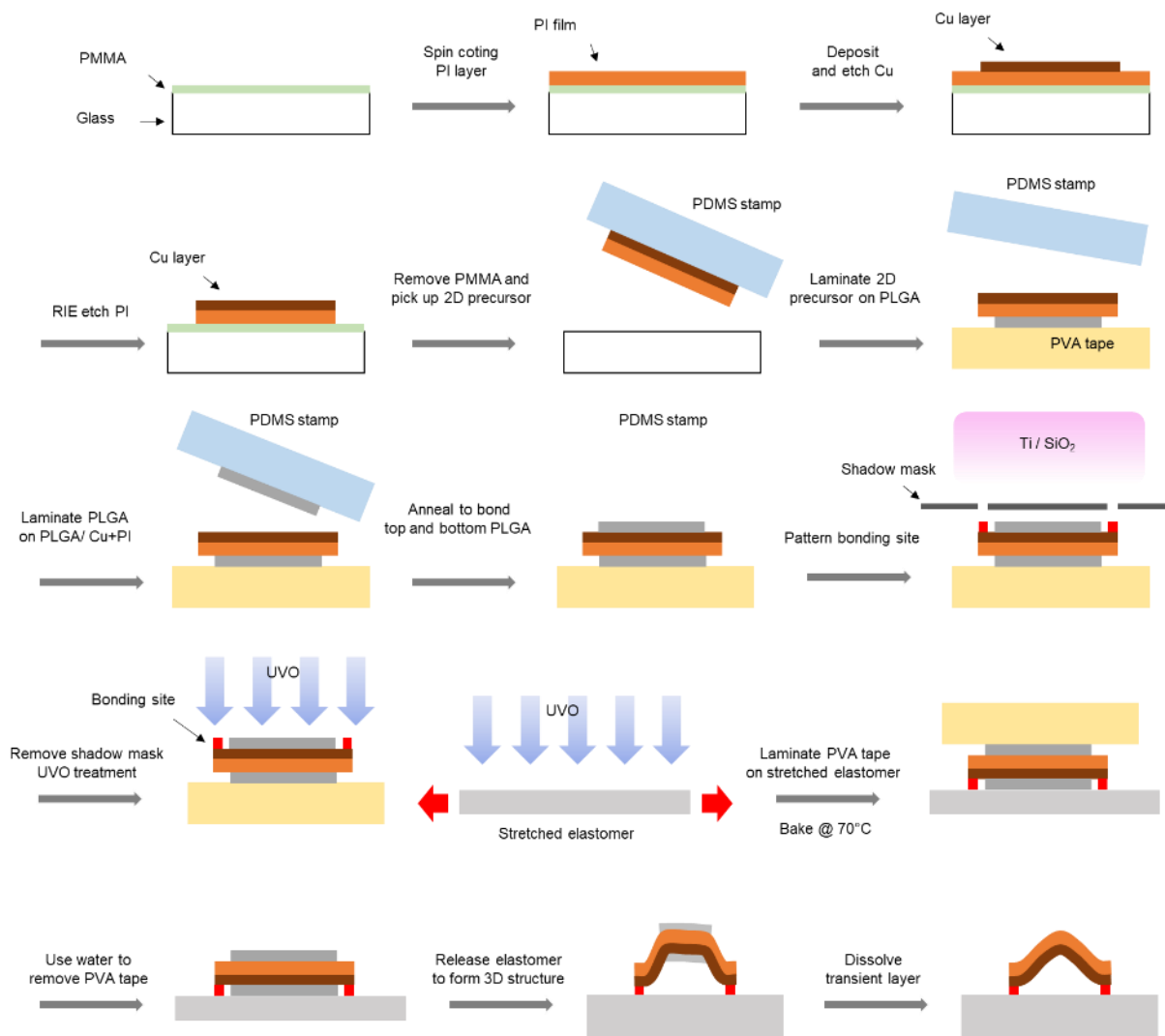


Figure S2. Schematic illustration of steps for fabricating 3D transformable mesostructures.

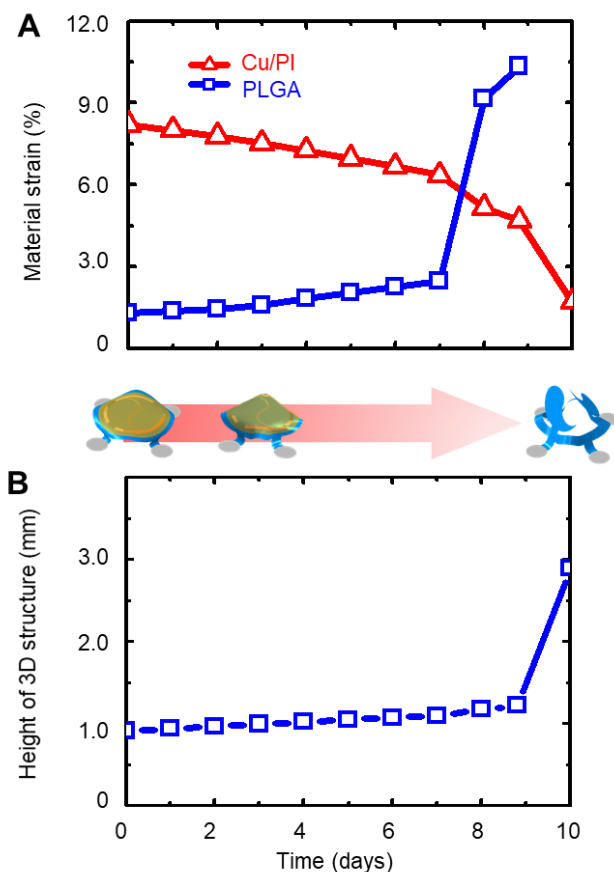


Figure S3. Quantitative data of transforming 3D mesostructures. (A) Material strain of Cu/PI and PLGA layer and (B) height of transformable 3D structures over 10 days with images of FEA predictions.

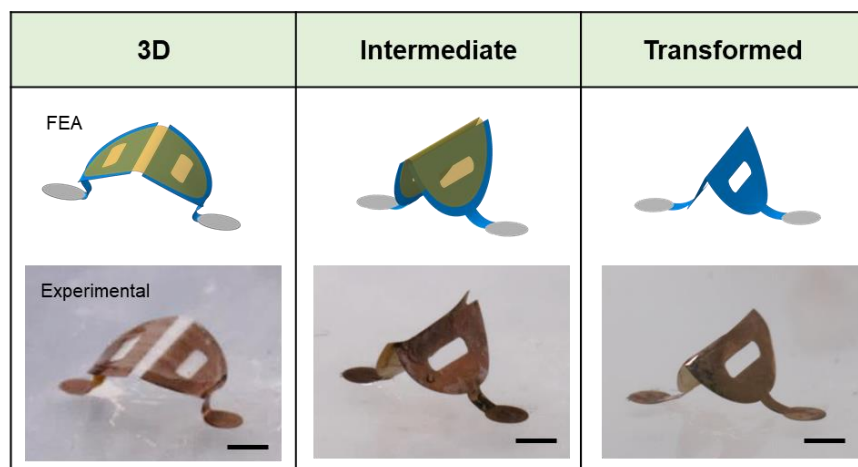


Figure S4. Experimental images and FEA predictions of an unusual 3D shape that forms upon dissolution of a transient layer of PLGA. The two non-transient parts lean against one another to hold an 3D structure uniquely realizable in this system. Scale bar, 1 mm.

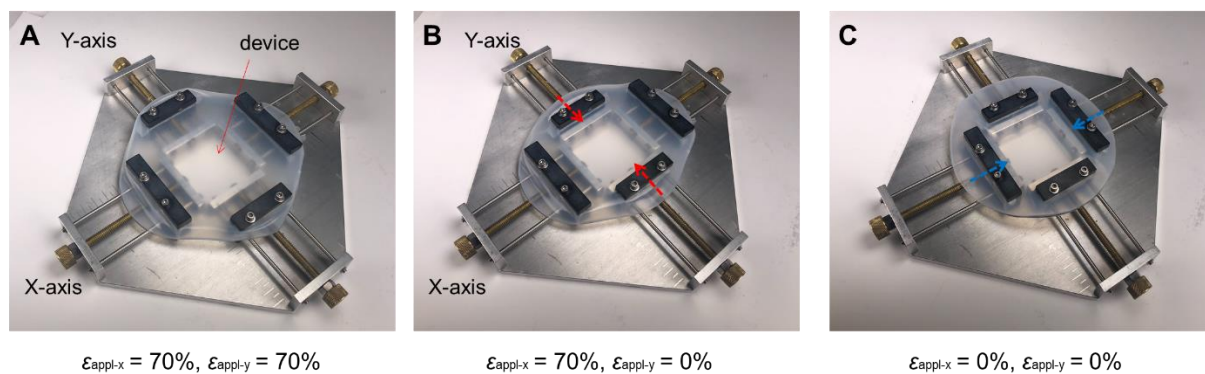


Figure S5: Optical images of a customized equal-biaxial stretching stage with an elastomer. (A) initial state (70% stretching X and Y-axis), (B) Releasing the strain along the Y-axis to 0% to interlock the hooks and lugs on the Y axis, (C) Releasing the strain along the X axis to complete the interlocking system.

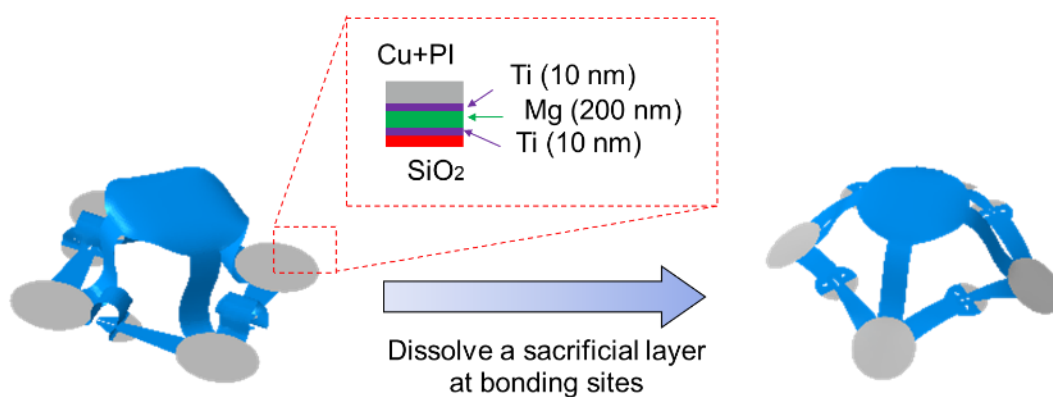


Figure S6. Schematic illustration of releasing 3D mesostructure by dissolving a sacrificial layer at the bonding sites in water. Bonding sites include 200 nm layers of Mg that can be dissolved in water.

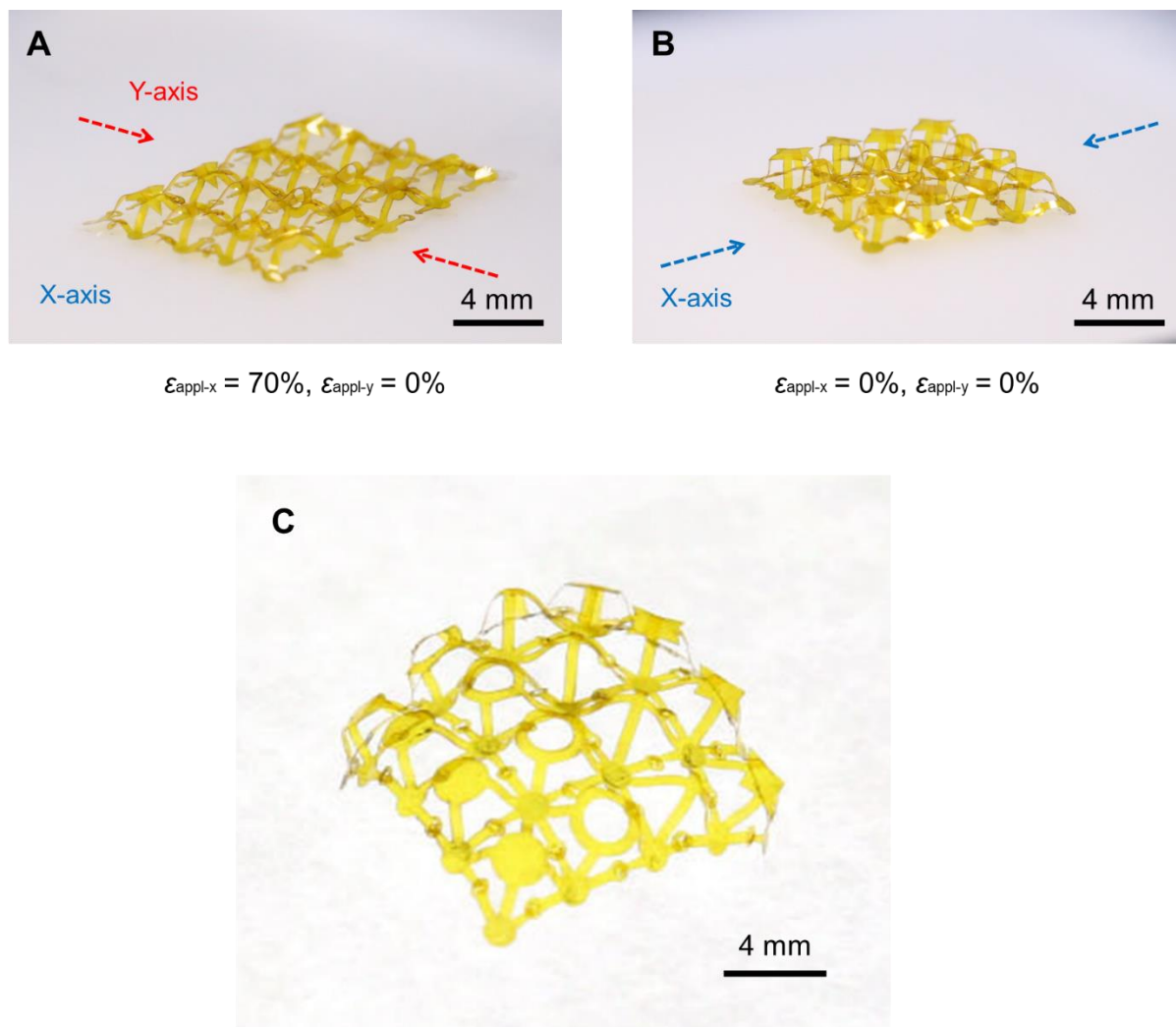


Figure S7: Optical images of a 4 by 4 array of freestanding 3D structures based on mechanical interlocking. (A) Interlocking of hooks and lugs along the Y-axis (B) and X-axis. A freestanding 3D structure consists of a 4 by 4 array of interlocking features.

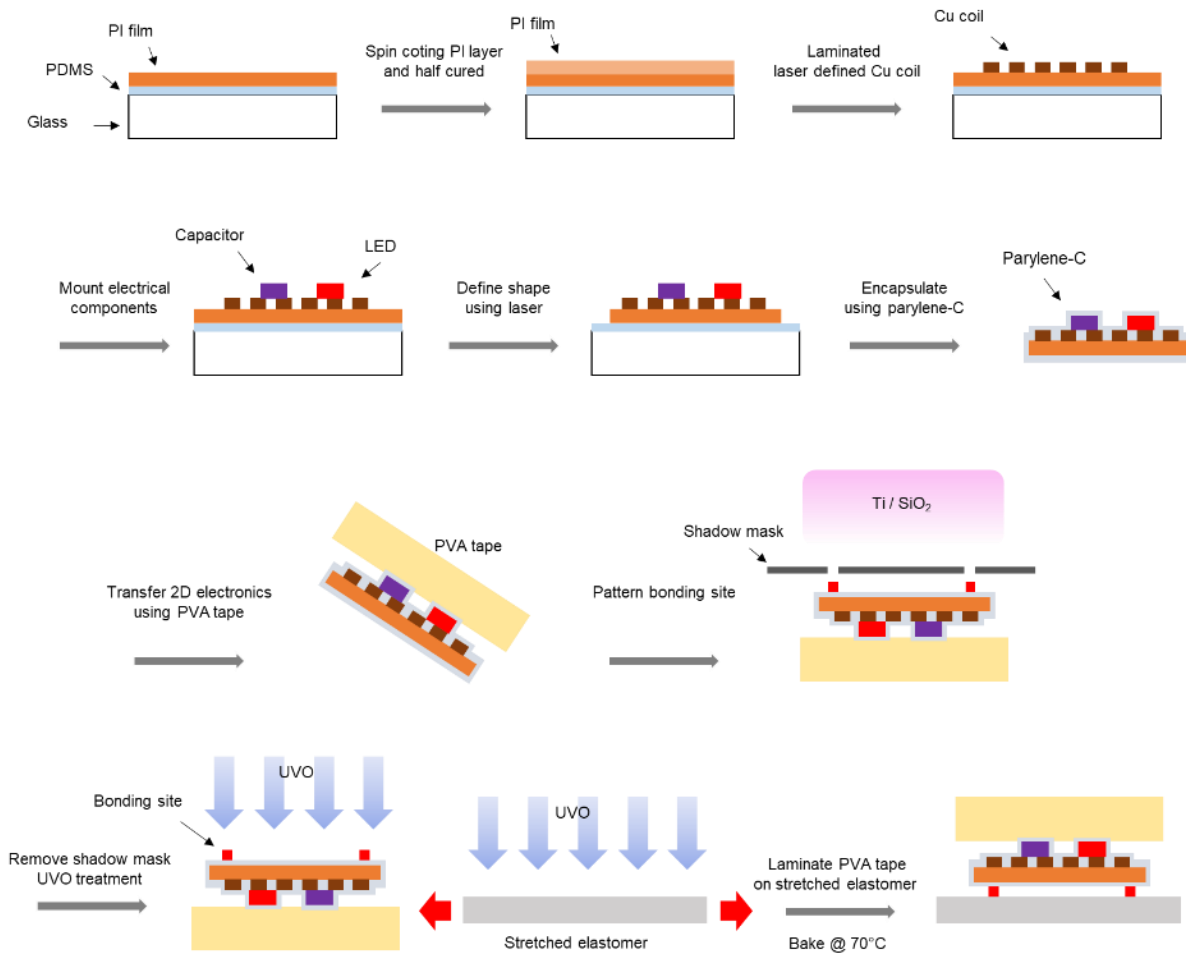


Figure S8. Schematic illustration of steps for fabricating 4D electronics, transformable and freestanding.



Figure S9. Photograph images of 3D electronics at various states of immersion in phosphate-buffered saline (PBS) at 70°C. Scale bar 3 mm.

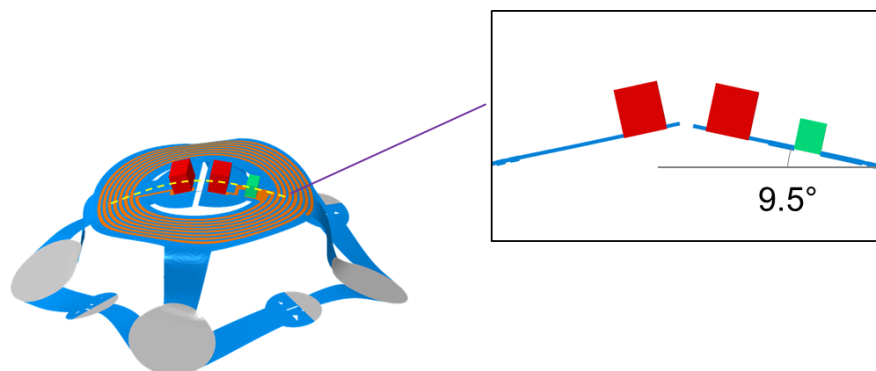


Figure S10. Schematic illustration of angular change of light emitting 3D electronics by dissolution of a transient layer.



Figure S11. Captured images during transformation of 3D device from a video (transform.mp4). For accelerating dissolution of PLGA, we immersed 4D structure into a solution (Aceton:DI, 1:1) instead of PBS.

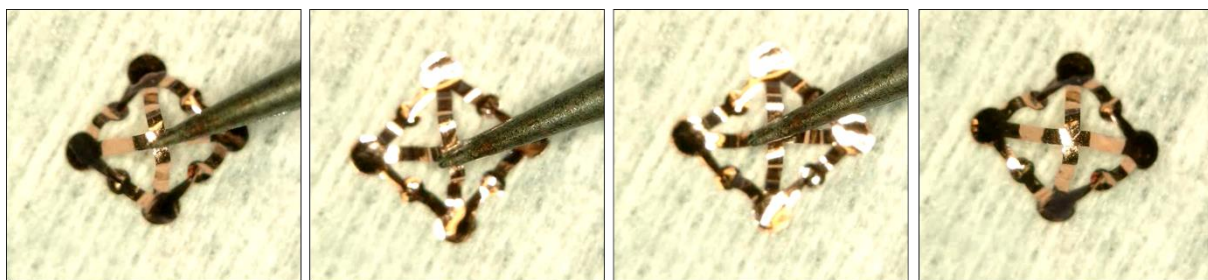


Figure S12: Captured images of a device (mechanical stability test) from a video (robust.mp4).