

3D Printing of Shape Memory Polymers (SPM) for Flexible Electronic Devices (photocurable resin based SMP)

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- a layer-by-layer UV curing method with stereolithography (SLA) 3D digital light processing (DLP)
 - layer thicknesses as low as 1 μm
- **Polycaprolactone** (PCL) - a melting temperature of 55°C
 - The degree of methacrylation affects the crystallinity and mechanical properties of the printed objects.
- Shape Memory Behavior: with strain fixity rates above 98% and strain recovery rates above 93%.

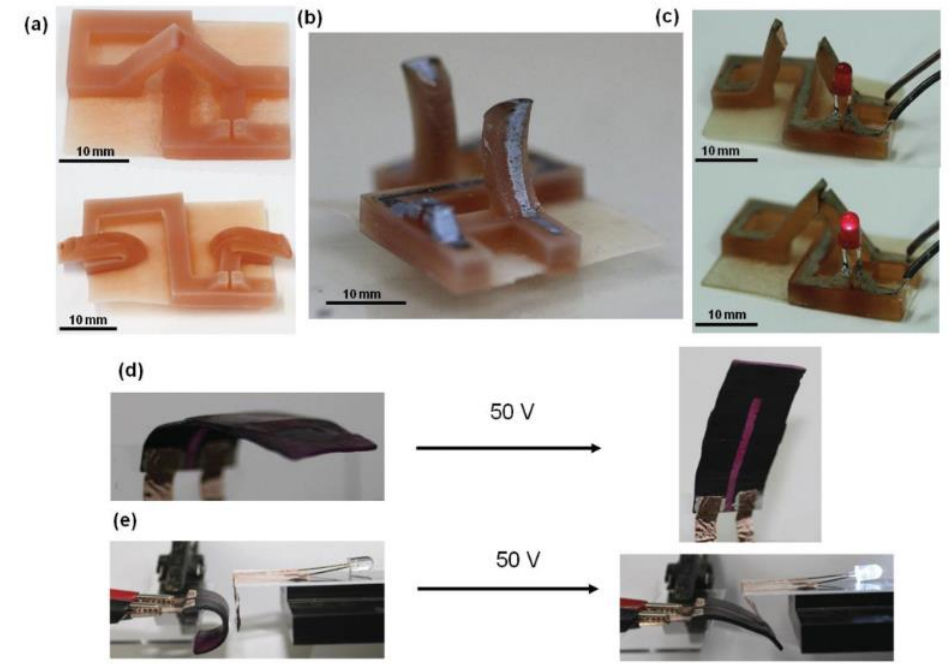
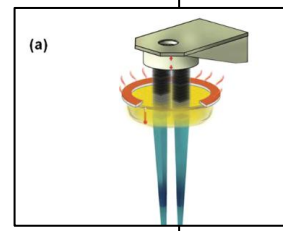


Figure 3. Fabrication of shape memory-based electrical devices. a) A 3D printed construct (top) programmed into its temporary state to enable inkjet printing on a 2D surface (bottom). b) Conductive ink printed (OmniJet100 inkjet printer) on the shape memory construct. c) Fabricated temperature sensor in its off state (top) and on state (bottom). d) The SMP object was printed as a flat sheet followed by deposition of a CNT layer and was fixated in a curved state (left image). When a voltage was applied, the crystalline fraction melted leading the structure to return to its original flat state (right image). e) The SMP object is used as a shape memory connector, which upon applying the voltage closes the electrical circuit.

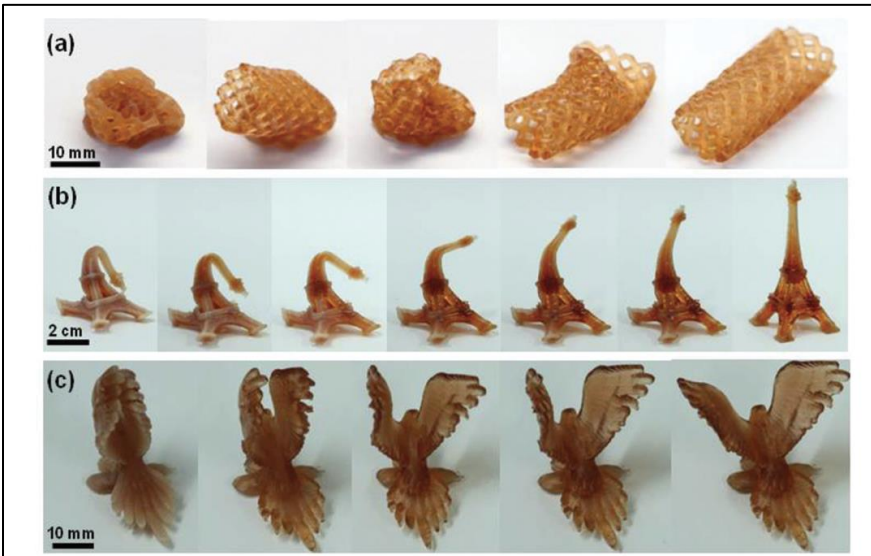


Figure 2. SLA with a molten macromethacrylate can impart shape memory to nearly any object. a) A model cardiovascular stent with a length of 3 cm, strut thicknesses of 600 μm , and open cells of 2.5 mm \times 2.5 mm, reverting to its original shape at 70 °C. Printing such a model stent takes 1 h with the Asiga printer. b) An Eiffel Tower model, 6 cm tall reverting to its original shape at 70 °C. c) A bird with a 3 cm wing span reverting to its original shape at 70 °C.

[3D Printed Shape Memory Electrical Circuit \(youtube.com\)](#)

[3D Printed Shape Memory Bird \(youtube.com\)](#)

Reference
 Zarek, M., Layani, M., Cooperstein, I., Sachyani, E., Cohn, D. and Magdassi, S. (2016), 3D Printing of Shape Memory Polymers for Flexible Electronic Devices. *Adv. Mater.*, 28: 4449-4454.
<https://doi.org/10.1002/adma.201503132>