

3D printing of responsive materials: from sensors to soft robotics

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ABSTRACT

The development of 3D printing, in particular light-induced printing (also called stereolithography) permits to exploit the knowledge gathered on polymers in the last century. The use of light can give, in line of principle, to sub-micrometric resolution opening the way to micro devices. In fact, polymeric responsive materials can lead to a shape change of the object, a feature useful for actuators.

By controlling the anisotropy of the material, the shape change can be driven accordingly¹. Also different materials can be used at the same time (pure or in mixture) and polymerized at different wavelengths in order to control the stiffness (and thus controlling the swelling behaviour)².

These techniques open the way to applications that are not even imaginable with current manufacturing. As an example, microfluidic logic circuits can be printed and serve as ‘brain’ for autonomous all-printed soft robots³.

In the course of the presentation, a route to sustainable green polymers will be discussed⁴.

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