SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

3D Printed Shape-memory Polymers

Background

Shape-memory polymers that can predictably morph in response to temperature can be useful for a number of applications, from soft actuators that turn solar panels toward the sun, to tiny drug capsules that open upon early signs of infection. However, using conventional 3-D printers, researchers have only been able to design structures with details no smaller than a few millimetres.

Technological Solution

To print shape-memory structures with even finer details, a method using light for 3D printing was pioneered called microstereolithograph, in which they use light from a projector to print patterns on successive layers of resin. Using this novel approach, the structures can "remember" their original shapes, even after being stretched, twisted, and bent at extreme angles, the structures — from small coils and multimaterial flowers, to an inch-tall replica of the Eiffel tower — sprang back to their original forms within seconds of being heated to a certain temperature within the range of 40 C to 180 C.

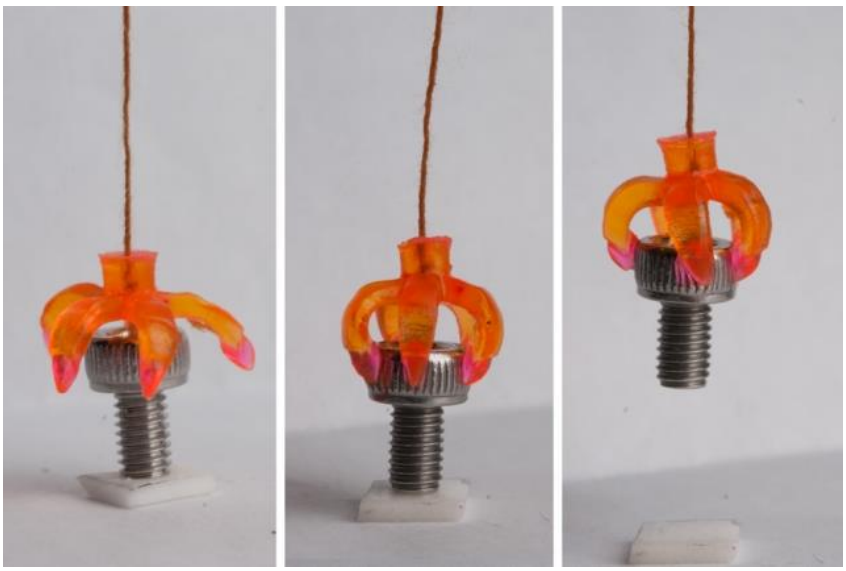

Fig. 1: 3D printed multimaterial shape-memory minigripper, consisting of shape-memory hinges and adaptive touching tips, grasps a cap screw

Value Preposition

Microstereolithograph could help develop a combinations of polymers to make shape-memory materials that react to lower temperatures, ones within the range of human body temperatures, for use in soft, active, controllable drug delivery capsules.

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