SHAPE MEMORY POLYMER USING SLA PROCESS

TechnologyOverview

Additive manufacturing (AM), also known as 3D printing or rapid prototyping, has advanced at remarkable speed, emerging as a robust technology to substitute existing manufacturing in increasingly complex tasks. However, printed parts are typically static and non-adaptive.

This technology relates to developing a photo-sensitive polymer resin that exhibits shape memory properties suitable for 3D printing via UV curing. The developed shape memory polymer (SMP) also displays robust shape recovery over multiple cycles that meets industrial needs.

Potential Applications

This invention is targeted towards applications that require repetitive tasks.

1. Wearer-Friendly 3D Printed Orthopaedic Cast with Shape Memory Functionality
   - Conformal design of casts for each individuals
   - Easy wearing and removal of casts for assessment of wounds
2. Re-usable Molds
   - Complicated molds can be removed in its rubbery state at temperature above its glass transition temperature and recover upon reheating to be reused several times
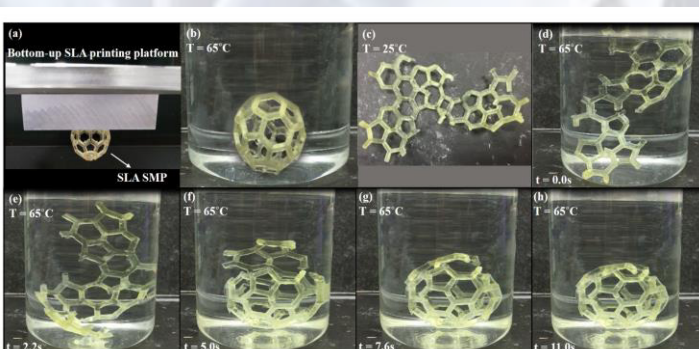
Customer Benefits

The invention aims to not only overcome the limitations in geometric complexity which traditional methods struggle to achieve, but also expanded material processing for new class of smart and responsive materials for 4D printing.

Tunable shape memory properties in terms of transition temperatures are also achievable through regulating material compositions, hence widening the spectrum of materials for more applications.

Features & Specifications

This invention has established and demonstrated several key characteristics

- Rapid curing characteristics (< 3secs)
- High dimensional accuracy for intricate features
- Tensile strength of SLA-printed SMPs (20.2MPa) were comparable to commercial thermoset Veriflex SMP (23MPa), while the elongation was 82% higher than Veriflex.
- Outstanding durability of over 20 shape memory cycles

Dental aligners fabricated from the developed SMP

SLA - printed SMPs with complex geometries that recover within 11s upon thermal heating using hot water

If you are interested in this technology, please contact the BD Manager: edmund.lim@ntu.edu.sg

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