Docket #: S22-128

Faster Multimaterial 3D Printing with High Viscosity Resins (iCLIP)

Researchers at Stanford have developed an additive manufacturing approach, called VIA, that enables rapid printing of solid 3D geometries with high viscosity composite resins and multimaterials. VIA (short for vat injection additive manufacturing through spatioselectively-programmable microfluidic ducts) is a novel hybrid 3D printing method that uses active control of mass transport during continuous printing to synergistically enhance print speeds, enable printing of high viscosity resins and allow rapid printing of multiple different resins simultaneously, at varying scales and with tuneable mechanical properties. Using current methods, controlling fluid flows laterally and achieving desired gradients remain extremely difficult in multimaterial printing. VIA controls multimaterial boundaries in a 3D printed object by simultaneously printing a complex microfluidic network that administers material flows adjacent to, or within, the 3D printed object itself.

Stage of Development
Prototype. The team has demonstrated several use-cases for rapidly printing carbon nanotube-filled composites, multimaterial features with length scales spanning orders of magnitude, and lattices with tunable elastic moduli and energy absorption.

Applications

- Multimaterial 3D printing of scalable and high resolution composite structures
- Microfluidics
- Biomedical
- Architectural design
- Mechanical, automotive and aerospace engineering

Advantages

- Accelerates printing speeds 5 to 10-fold over current methods (e.g., continuous liquid interface production)
- Enables use of high viscosity resins
- Allows rapid and simultaneous printing of multiple different resins
- Controls multimaterial flows in all Cartesian dimensions

Publications

- Lipkowitz, Gabriel, et al. "Injection continuous liquid interface production of 3D objects." *Science Advances* (2022)
- Castanon, Laura. "New 3D printing method designed by Stanford engineers promises faster printing with multiple materials." *Stanford News* (2022)

Patents

- Published Application: WO2023177815

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