Docket #: S21-408

Photoenzymatic Bioprinting

Inventors at Stanford University have developed a light-based 3D printing system that achieves high printing resolutions and fast printing speeds with cell-compatible natural protein biomaterials when compared to existing methods. The invention uses a device that patterns light from an LED source into a polymerization bath, where polymerization of a protein-based biomaterial is induced by a light-regulated biocatalyst. Additionally, the light-regulated enzyme is activated and inhibited at different wavelengths to improve resolution. A motor moves the build platform to enable layer-by-layer printing of horizontal planes in the resulting 3D object. Preliminary data suggests that the photoenzymatic bioprinting system enables high resolution patterns of 3D scaffolds, with high cell viability and functional behavior.

Stage of Development
The authors have built and tested a successful prototype of the invention and are working to characterize and optimize the parameter space.

Applications

- Constructing tissue engineering grafts for surgical applications
- 3D printed tissues of fully biological composition used in pre-clinical drug studies
- Reagent generation for academic labs

Advantages

- Current methods rely on synthetic materials that are not as biocompatible as printing methods with natural protein biomaterials
- Current methods to print biomaterials do not match print speed or resolution of light-based printing

Patents

- Published Application: WO2023102558
- Published Application: 20250041479

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