1. Introduction to micro-continuous liquid interface production process

Additive Manufacturing (AM), or commonly known as the 3D printing process, is ushering in a revolutionary change of manufacturing techniques. In particular, the recent development of micro-continuous liquid interface production (μCLIP) method further advances the projection based stereolithography process with a significant increase in manufacturing speed (*Fig. SC1*) [1-3]. The μCLIP process utilizes digital micro-mirror dynamic mask (DMD, Taxes Instruments) to control the optical field and thus, by being projected through the projection lens, the two-dimensional (2D) layer can be fabricated simultaneously via the photopolymerization process. It significantly parallelizes the otherwise slow 3D printing processes that are serial in nature. Furthermore, μCLIP process utilizes an oxygen permeable membrane as the optical transparent window. This creates an oxygen-rich region near the membrane, effectively inhibiting the photopolymerization under the illumination of the projected ultraviolet (UV) light. This unique design effectively avoids the adhesion of the polymerized structure to the optical windows, making it possible to create 3D structure under a continuous upwards motion of the substrate state (Z-stage) with significant reduction in the fabrication time. The 3D solid model is used to directly synchronize display on the dynamic mask and the continuous motion of the Z-stage rapidly fabricates the sophisticated 3D scaffolds.

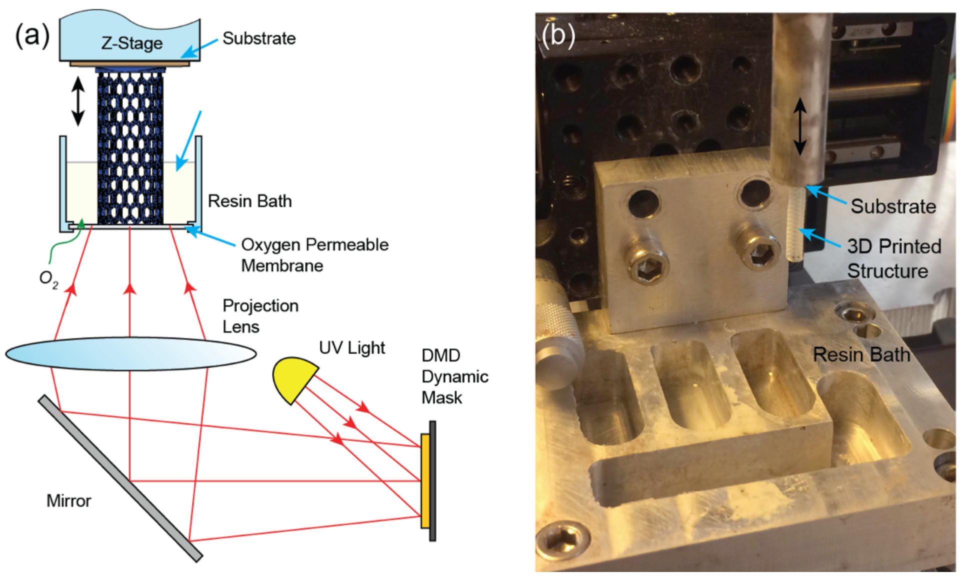

Fig. SC1. (a) Schematic illustration of the μCLIP process. Rapid fabrication of 3D parts is accomplished via simultaneously control of the display on dynamic mask and the continue upwards motion of the substrate. The design of a vascular stent is used here for illustration purpose. (b) The photos of the actual printing process using the μCLIP system in Prof. Sun's lab;

2. Proposed hybrid μCLIP process on lithographically integrated functional substrate

In addition, we plan to further develop a hybrid μCLIP process enables additive manufacturing of 3D scaffold on lithographically integrated functional substrate. As shown in Fig. SC2, an in-line imaging system captures the fluorescent image of Parylene C fingers being suspended in the liquid resin. The acquired image will be mathematically "mixed" with the bitmap mask for the current building layer and thus, enables structural integration of suspended Parylene C fingers within the 3D printed scaffolds. As an example, we can dynamically fabricate hollow conduits to accommodate the Parylene C fingers by blacking out the bitmap mask surrounding the location of the Parylene C fingers. Thus, the parylene C fingers can be integrated in the 3D scaffold, while still preserves its connectivity to the substrate.

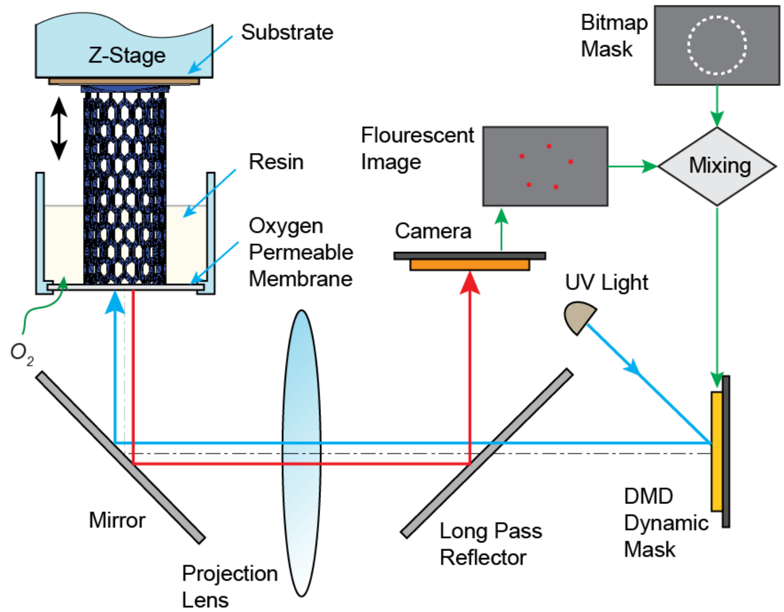

Fig. SC2. Schematic illustration of the proposed hybrid μCLIP process enables additive manufacturing of 3D scaffold on lithographically integrated functional substrate. Rapid fabrication of 3D scaffold is accomplished via simultaneously control of the display on dynamic mask and the continue upwards motion of the substrate. The in-line imaging system captures the morphology of the functional components on the substrate in the real-time, which can be future incorporated into the bitmap mask to incorporate them into the 3D printed scaffold.

3. System cost breakdown

Item	Description	Manufacturer	Cost ($)
1	3DLP9000 UV Light Engine	Digital Light Innovations	$22,125.00
2	HD-Resolution, Low-Noise USB 3.0 CMOS Cameras with Global Shutter	Thorlabs	$1,776.75
3	High-resolution Projection lens	Jenoptik	$4,495.00
4	Translation Stage (1-axis)	Aerotech	$15,000.00
5	Misc optics, optomechanical, and electric components		$5,000.00
		Total:	$48,396.75

1 Tumbleston, J. R. *et al.* Continuous liquid interface production of 3D objects. *Science* **347**, 1349-1352, doi:10.1126/science.aaa2397 (2015).

2 Sun, C., Fang, N., Wu, D. M. & Zhang, X. Projection micro-stereolithography using digital micro-mirror dynamic mask. *Sensors and Actuators a-Physical* **121**, 113-120 (2005).

3 van Lith, R. *et al.* 3D-Printing Strong High-Resolution Antioxidant Bioresorbable Vascular Stents. *Advanced Materials Technologies*, 1600138-n/a, doi:10.1002/admt.201600138 (2016).