Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information
Optical Approach to Resin Formulation for 3D Printed Microfluidics

S1 Results for 3D Printing Service Bureaus

We evaluated the minimum flow channel size that can be fabricated by commercial 3D printing service bureaus using a calibration test design. The design is included as an stl file as part of the ESI (3d_printing_bureau.stl) and is shown in Fig. S1. A series of channels with decreasing cross section size are included in the vertical wall. The size begins at 700 μm × 700 μm and decreases left-to-right in 50 μm increments to 200 μm × 200 μm, followed by three additional channels, 150 μm × 200 μm, 100 μm × 200 μm, and 50 μm × 200 μm. All channels are 1.08 mm long so the results can be directly compared with results for the other resins reported in the paper.

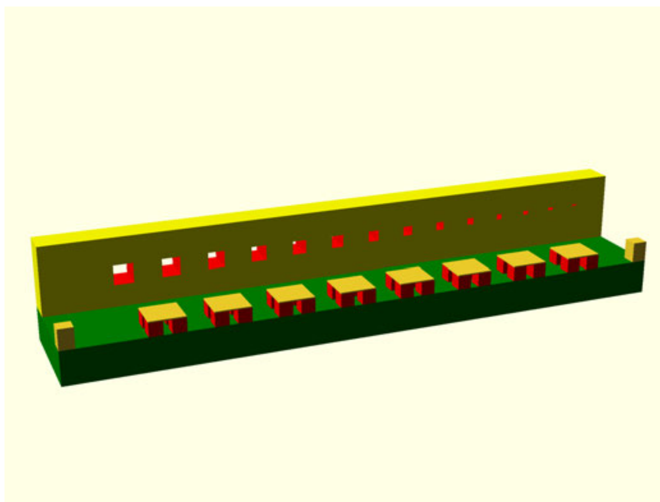


Figure S1: Test design for 3D printing service bureaus.

Service bureau and process details are in Table S1 below. Two 3D printing fabrication methods are used, stereolithography (SL) and polyjet.

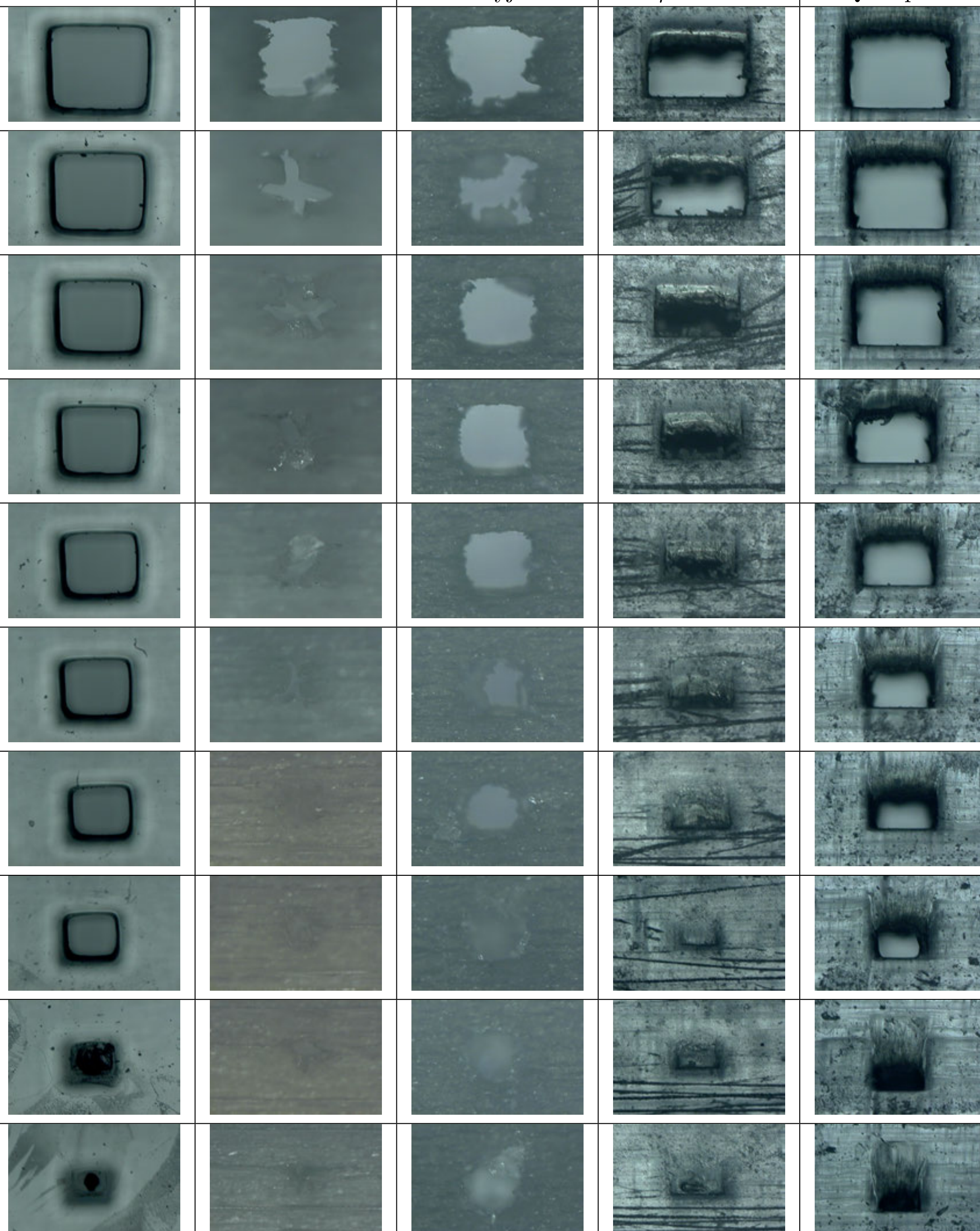
Table S1: 3D printing service bureau information.

Vendor	Process	Comments
Fineline - Proto Labs	SL	WaterShed XC 11122 High-Resolution Stereolithography build in 0.002" layers with a substrate build style
Invent-A-Part	Polyjet	
Stratsys	Polyjet	PolyJet HD process
Stratsys	SL	Micro-High Definition Stereolithography (μHDSL) process
3D Systems Quickparts	SL	Special request to not sand and bead blast part–just clean it

Fabrication results are shown in Table S2. Both Fineline and 3D Systems Quickparts are able to print channels down to 350 μm × 350 μm. The polyjet processes (Invent-A-Part and Stratasys) were less successful. By far the

Table S2: Microscope photographs of channels fabricated with commercial 3D printing service bureaus.

Channel size	Fineline	Invent-A-Part	Stratasys Polyjet	Stratasys μHDSL	3D Systems Quickparts
700 μm × 700 μm					
650 μm × 650 μm					
600 μm × 600 μm					
550 μm × 550 μm					
500 μm × 500 μm					
450 μm × 450 μm					
400 μm × 400 μm					
350 μm × 350 μm					
300 μm × 300 μm					
250 μm × 250 μm					



sharpest, smoothest, and most optically clear part is the one from Fineline, which also has a 500 μm × 500 μm minimum dimension specification.

S2 Varying Channel Height and Build Layer Thickness for PEGDA Resins

Table S3: Results for different channel heights and layer thicknesses for PEGDA resins with varying concentrations of Sudan I. See paper text for details.

		Sudan I concentration			
Channel	Layer	0.4%	0.2%	0.15%	0.1%
100μm	10 μm	16/16	0/24	0/30	0/12
	25 μm	17/17	0/14	0/24	0/11
	50 μm	0/8	0/32	0/36	0/11
150μm	10 μm	16/16	0/14	0/20	0/12
	25 μm	20/20	11/14	5/8	0/11
	50 μm	0/8	2/14	15/20	0/11
200μm	10 μm	16/16	14/14	12/24	0/12
	25 μm	17/17	14/14	14/14	0/11
	50 μm	0/8	10/14	23/23	0/11
250μm	10 μm	24/24	24/24	24/24	5/11
	25 μm	24/24	24/24	8/8	2/11
	50 μm	0/24	24/24	12/12	5/11

Table S4: Normalized layer thicknesses, ζ_l, and exposure times, t_l, for the results in Table S3.

Sudan I concentration	0.4%			0.2%			0.15%			0.1%		
z_l (μm)	10	25	50	10	25	50	10	25	50	10	25	50
ζ_l	0.57	1.42	2.85	0.30	0.75	1.50	0.17	0.43	0.87	0.08	0.31	0.62
t_l (s)	0.8	2	8.5	0.45	0.71	1.5	0.47	0.61	1		0.52	0.75