

Patterning of Microorganisms and Microparticles through Sequential Capillarity-assisted Assembly

Roberto Pioli¹, Roman Stocker¹, Lucio Isa², Eleonora Secchi¹

¹Institute of Environmental Engineering, Department of Civil, Environmental and Geomatic Engineering, ETH Zurich ²Department of Materials, ETH Zurich

Corresponding Author

Eleonora Secchi
esecchi@ethz.ch

Citation

Pioli, R., Stocker, R., Isa, L., Secchi, E. Patterning of Microorganisms and Microparticles through Sequential Capillarity-assisted Assembly. *J. Vis. Exp.* (177), e63131, doi:10.3791/63131 (2021).

Date Published

November 4, 2021

DOI

10.3791/63131

URL

jove.com/video/63131

Materials

Name	Company	Catalog Number	Comments
Alcatel AMS 200SE I-Speeder	Alcatel Micro Machining System		deep reactive ion exchange system
Alconox			detergent
AZ400K developer	MicroChemicals	AZ400K	
BD 10 mL Syringe (Luer-Lock)	BD	300912	used to flush fresh Lysogeny broth into the microfluidic channel
Box Incubator	Life Imaging Services		used to ensure a uniform and constant temperature in the channel
Centrifuge	Eppendorf	5424R	used to replace the overnight media with fresh minimal media
Centrifuge vial	Eppendorf	30120086	1.5 mL
CETONI Base 120	CETONI GmbH		syringe pump
Fluorescent PS particles of diameter 0.98 µm (red)	microParticles GmbH	PS-FluoRed-Fi267	
Fluorescent PS particles of diameter 1.08 µm (green)	microParticles GmbH	PS-FluoGreen-Fi182	
Fluorescent PS particles of diameter 2.07 µm (green)	microParticles GmbH	PS-FluoGreen-Fi183	
Fluorescent PS particles of diameter 2.08 µm (red)	microParticles GmbH	PS-FluoRed-Fi180	
Gigabatch 310 M	PVA TePla		used to plasma treat a 10 cm silicon wafer
H401-T-CONTROLLER	Okolab		controller of the heated glass plate
H601-NIKON-TS2R-GLASS	Okolab		heated glass plate
Heidelberg DWL 2000	Heidelberg Instruments		UV direct laser writer
Insulin syringes, U 100, with luer	Codan Medical ApS	CODA621640	1 mL syringe used to withdraw the liquid suspension during the patterning process
Klayout	Opensource		used to design the features on the silicon master
LB Broth, Miller (Luria-Bertani)	Fisher Scientific	244610	Lysogeny broth flushed into the microfluidic channel

Masterflex transfer tubing	Masterflex	HV-06419-05	0.020" ID, 0.06" OD
MOPS (10x)	Teknova	M2101	diluted tenfold with milliQ water and used to replace the overnight medium
Nikon Eclipse Ti2	Nikon Instruments		microscope
openSCAD	Opensource		used to design the mold
OPTispin SB20	ATM group	51-0002-01-00	spin developer
Plasma chamber Zepto	Diener Electronic	ZEPTO-1	used to plasma treat the template and microchannel to bond them
Positive photoresist AZ1505	MicroChemicals	AZ1505	
Potassium phosphate dibasic	Sigma Aldrich	P3786	added to MOPS 1x
Prusa curing and Washing machine CW1S	Prusa		used to ensure all polymer is cured and uncured polymer is removed from the mold
Prusa Resin - Tough	Prusa Research a.s.		UV photosensitive 405nm liquid resin for 3D printing
Prusa SL1 3d printer	Prusa		used to print the mold
Scale	VWR-CH	611-2605	used to weight PDMS mixture
Silicon wafer (10 cm)	Silicon Materials Inc.		N/Phos <100> 1-10 Ω cm
Süss MA6 Mask aligner	SUSS MicroTec Group		used to align the chrome-glass mask and the substrate, and expose the substrate
Sylgard 184	Dow Corning		silicone elastomer kit; curing agent
Techni Etch Cr01	Technic		chromium etchant
Trichloro (1H, 1H, 2H, 2H-perfluorooctyl) silane	Sigma Aldrich	448931	used to silanize the 3D printed mold
TWEEN 20	Sigma Aldrich	P1379	used to ensure an optimal receding contact angle during the patterning process
Veeco Dektak 6 M	Veeco		profilometer
VTC-100 Vacuum Spin Coater	MTI corporation		vacuum spin coater