engineering proceedings

MDPI

Supplementary Document

Table S1: Summary table of twenty papers

Paper	Objective	Stamp	Substrate	Ink	Manufacturing Method
Chang et al. 2022 [3]	Print structures with different heights, pattern orientations and pixel lines using plasma-assisted microcontact printing to transfer inks to substrate through thermal evaporation process, instead of direct contact	Silicon	Silicon	Flurocarbon	Heating the loaded stamp with plasma treatment to transfer the ink onto the substrate
Ruan et al. 2019 [4]	Combine μCp and laser direct writing carbonization (LDWc) to form carbon disk arrays	PDMS	Quartz Sheet	Polyamic Acid (PAA)	Coated the Stamp with PAA and transferred them onto the Quartz substrate, and then subjected to LDWc to create arrays
Foncy et al. 2018 [5]	Create multiplex structures and microarrays for cell culture and increase reproducibility and capacity to handle vast areas exceeding 10 cm2.	Magnetic PDMS	Glass	1 mL of inking solution (Streptavidin on Phosphate buffered saline (PBS) or fibronectin in PBS)	Aligning a microfludic chamber with a stamp, and pumping magnetic ink into chamber to ink the stamp. The loaded stamp pressed onto the glass slide to create multiplex structures
Wang et al. 2020 [6]	Create gold nanoparticle stripes to be embedded into optical and sensing devices.	PDMS	Si and PDMS	Gold nanoparticle	Patterned the substrate with hydrophobic stripes using wrinkled stamps. Backfilled the stripe gaps with hydroxyl-functional poly(2-vinyl pyridine, or P2VP).

Paper	Objective	Stamp	Substrate	Ink	Manufacturing Method
					Submerged in a gold-citrate solution to deposit the stripe.
Hizir et al. 2020 [7]	Construct conductive structure into polymric devices	PDMS	Glass, PMMA, PET, COC	silver, gold and CNT nanoparticle ink	µCP equipment with a printing roll covered with a stamp for ink transfer
Akarsu et al. 2021 [8]	Create pattern on rough surfaces by transferring reactive salines with a view to achieving precision printing for complex geometries	PDMS	Polymer Brush	Functional Trivalent Alkoxysilanes	Modified PDMS stamps with polymer brushes to covalently immobilize organosilanes and transfer them to oxide surfaces
Zimmermann et al. 2018 [9]	Produce 3D multifunctional patches with self-assembly capability by controlling the diameter and thickness of the deposited layer	PDMS	4 µm and 5 µm Silica particles dispersed in 3 and 4 wt% of ethanol on glass substrate (mono layer)	1 - 4 wt% of polyethylenimine (PEI)	Pressing loaded stamp on the silica substrate, and using ultrasonic treatment with solvent to release the stamp.
Zimmermann et al. 2018 [10]	Moderate the thickness and diameter of the silica patches with self-assembly capability by the polyethylenimine (PEI) ink.	PDMS	same as above	same as above	same as above
Hu et al. 2018 [11]	Create protein cell arrays and determine the significance of protein-substrate adhesion on cell behavior	PDMS	PDMS	Protein Cells	Using Stamping and Covalent method to transfer ink onto the substrate
Qiu et al 2021 [12]	Review the applications of µCP in biomedicine	PDMS	Si/SiO2, Glass,	Protein Cells, bacterial strain	-

Paper	Objective	Stamp	Substrate	Ink	Manufacturing Method
Gimenez et al. 2022 [13]	Obtain cell Patterns by using Grayscale, Photopolymer Flexographic Mold, and PDMS	PDMS	cell culture plates functionalized by mixing PEG, PEGDA and photo initiator.	human induced pluripotent stem cells (hiPSC)	Grayscale patterns were printed in a flexographic photopolymer mold and transferred to an epoxy resin and a PDMS stamp to be used for cell culture
Kumar et al. 2018 [14]	Create split ring resonator using silk film and gold particles	PDMS	silk coated substrate	Gold, Lithium bromide or methanol	Coated silicon substrate with silk, loaded stamps with lithium bromide or methanol, and developed patterns in water. Then again, coated gold and immersed the pattern in a solution, creating a split ring resonator.
Wu et al. 2020 [15]	Fabricate SiOx/ (Cyclo-olefin polymer) COP Stamp and pattern TiO2 using that stamp	SiOx/COP	PDMS	TAA Gel	Creating SiOx/COP Stamp by Vacuum ultraviolet lithography
Yu et al. 2021 [16]	Print hybrid inverter circuits by inking on substrates with various surface energies using high-resolution roll-to-roll (R2R) microcontact printing (µCP) technique	PDMS	Si/SiO2, PVA, P(VDF-TrFE), CYTOP, and Durasurf-coated Si/SiO2 wafers	low boiling Point fluorinated ink solvent	Roll-to-roll microcontact printing by using inks with low boiling point
Yalcintas et al. 2019 [17]	Manufacture soft and stretchable electronics using µCP	Si and PDMS	PDMS	Gallium-Indium	Coating the roller with EGIn and pressing it against the extruded pattern on substrate using an in-house built machine

Paper	Objective	Stamp	Substrate	Ink	Manufacturing Method
Borowiec et al. 2018 [18]	Construct 3D microstructure channels on porous membranes and transfer extracellular matrix (ECM) proteins into the channels i.e. simultaneous chemical and topological patterning.	PDMS	Polycarbonate (PC) membrane	collagen, laminin and fibronectin	Microthermoforming and microcontact printing
Jin et al. 2023 [19]	Produce microarrays of antibodies with great resolution and multiplexity.	PDMS	Glass	breast cancer cells (MCF-7) and macrophages	micropillar-focused droplet printing and microcontact printing
Sperling et al. 2019 [20]	Create anisotropic structures by introducing patches of a low molecular weight ink (LMWI) onto porous SiO2 microparticles	PDMS, polymer grafed PDMS	SiO2 particles on glass	rhodamine B isothiocyanate (RITC)	PDMS stamps with functionalized surfaces are stamped with rhodamine B isothiocyanate (RITC) and pressed against SiO2 on glass support . Sonication frees patchy particles.
Zhu et al. 2018 [21]	Develop covalent modification tool by printing on the highly ordered pyrolytic graphite (HOPG) surface using inverse electron demand Diels-Alder (IEDDA) reaction	PDMS	highly ordered pyrolytic graphite (HOPG)	ferrocene-tetrazine (Fc-O-Tz) ink	Used ferrocene-tetrazine (Fc-O-Tz) ink to stamp onto the HPOG surface
Wu et al. 2018 [22]	Create micrometer-resolution hydrophilic polydopamine (PDA) patterns for chemical and biological screening using a negative microcontact printing technique on hydrophobic surfaces	PDMS	CYTOP-coated glass	PDA	Coated the glass substrate with CYTOP and PDA and stamp with the create the negative pattern

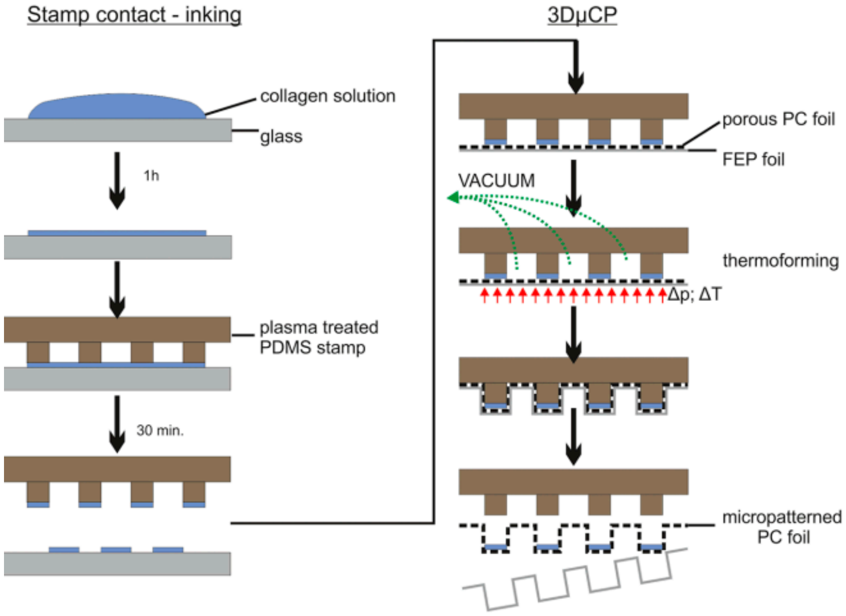

Figure S1: microstructuring and microcontact printing of PC membrane by Borowiec et al. [18] © 2018, American Chemical Society, Used with permission

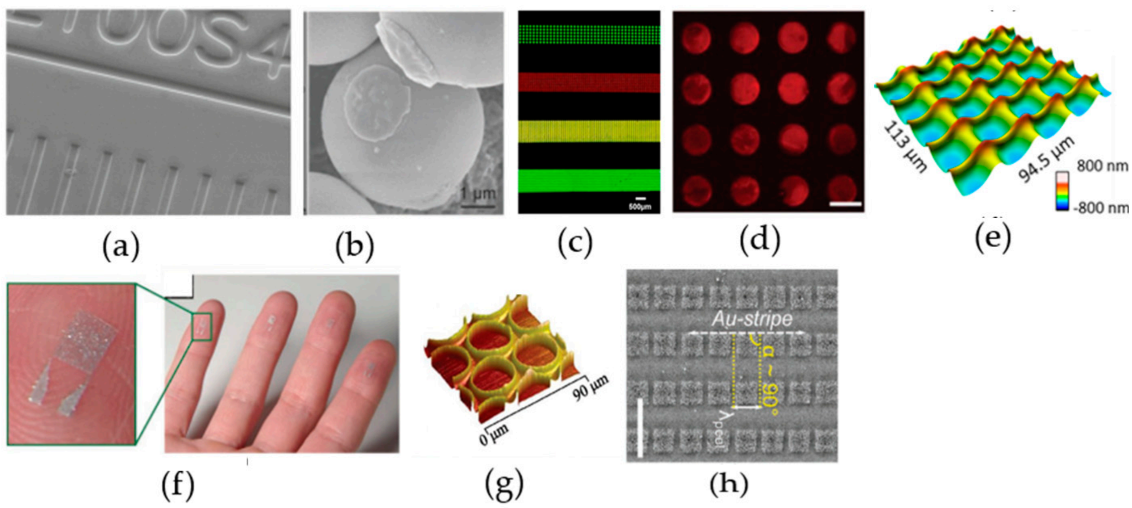

Figure S2: (a) surface topography of thermoformed patterns by Borowiec et al. [18] © 2018, American Chemical Society, Used with permission (b) 3D patches by Zimmermann et al. [9] © The Royal Society of Chemistry 2018; Used under CC BY-NC (c) fluorescence image of multiplex printing by Foncy et al. [5] © 2018 Foncy et al. Used under CC BY (d) Fluorescence micrograph showing the printed antibody array on the coverslip (Scale bar, 50 µm) by Jin et al. [19] © 2023 Wiley-VCH GmbH; Used with permission (e) Multipatterning by plasma printing by Chang et al. [3] © 2022, American Chemical Society; Used with permission (f) Stretechable electrnoics developed by Sperling et al. [20] © The Royal Society of Chemistry 2019; Used under CC BY-NA (g) Holey arrays developed by Ruan et al. [4] © 2019 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, Used with permission (h) Gold nanopartilce stripe (scale bar: 2µm.) printed by Wang et al. [6] © 2020 The Authors. Published by WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim; Used under CC

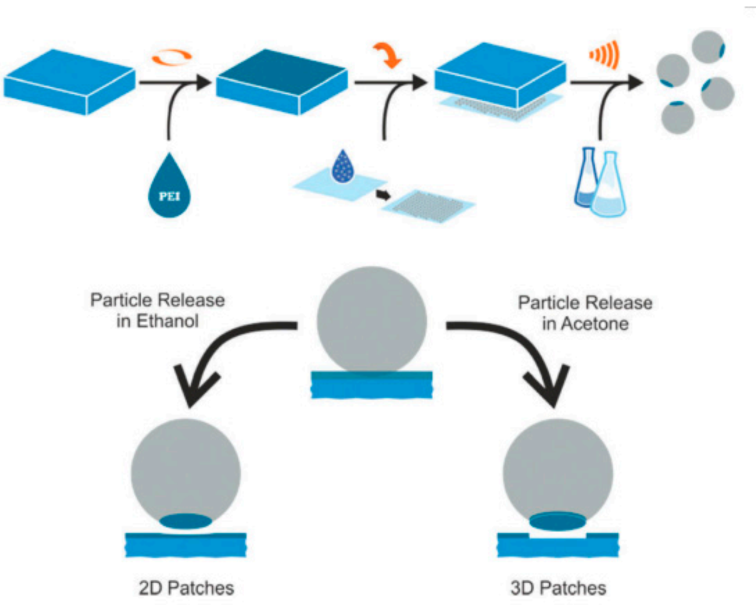

Figure S3: Silica Particle Printing by Zimmermann et al. [9,10] © The Royal Society of Chemistry 2018; Used under CC BY-NC

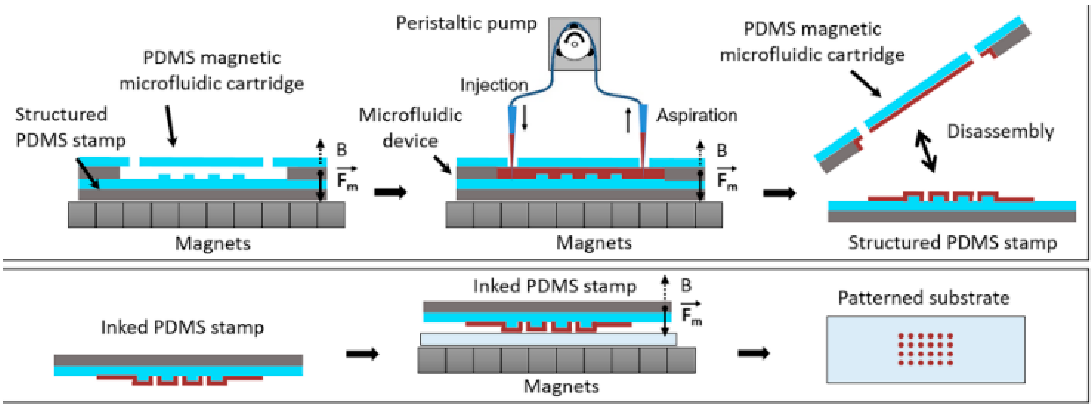

Figure S4: Microcontact printing with microfluidic device by Foncy et al. [5] © 2018 Foncy et al. Used under CC BY

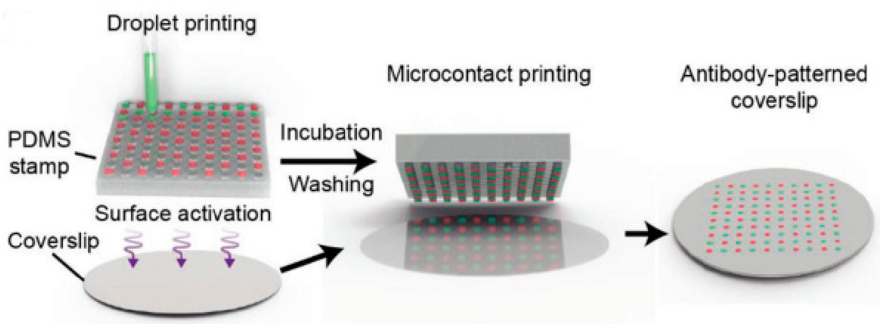

Figure S5: Microcontact printing by Jin et al. [19] © 2023 Wiley-VCH GmbH; Used with permission

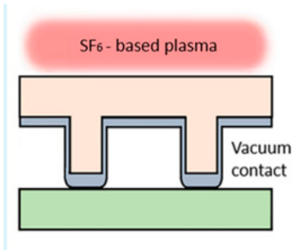

Figure S6: Plasma assisted microprinting by Chang et al. [3] © 2022, American Chemical Society; Used with permission

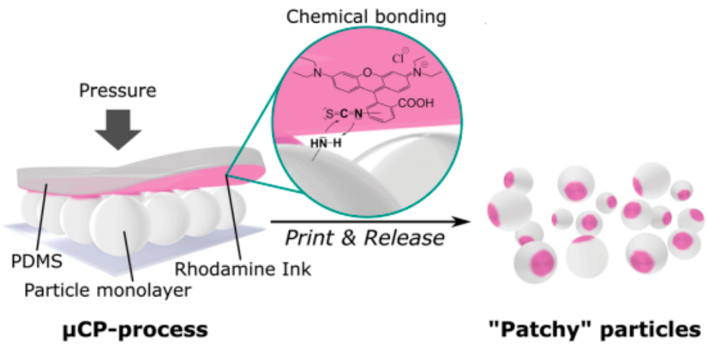

Figure S7: Printing by Sperling et al. [20] © The Royal Society of Chemistry 2019; Used under CC BY-NA

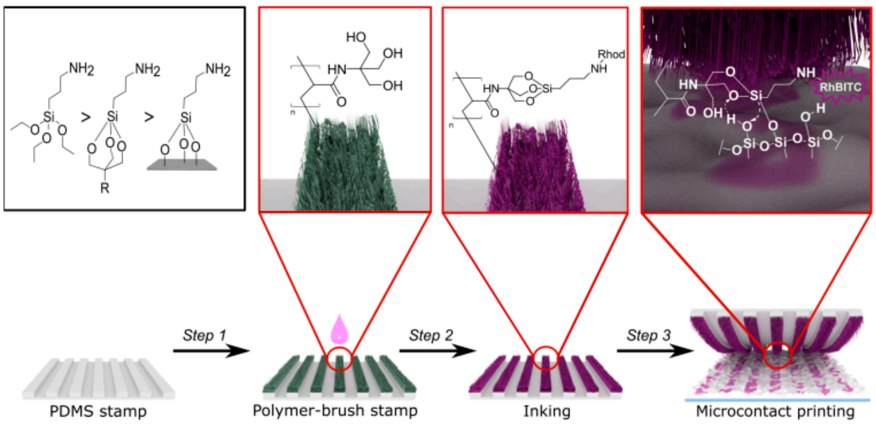

Figure S8: Printing by Akarsu et al. [8] © 2021 The Authors. Published by American Chemical Society; Used under CC-BY-NC-ND 4.0

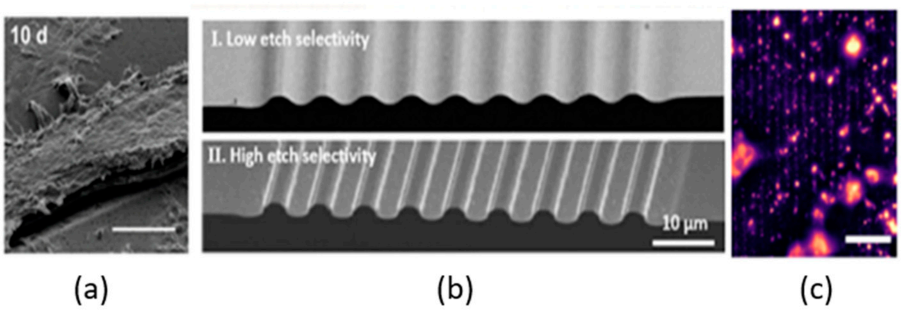

Figure S9: (a) Detaching cells after 10 days from Borowiec et al. [18] © 2018, American Chemical Society, Used with permission (b) Effect of etch selectivity on pattern depth from Chang et al. [3] © 2022, American Chemical Society; Used with permission (c) fluorescence image of polymer brush grafted µCP from Akarsu et al. [8] © 2021 The Authors. Published by American Chemical Society; Used under CC-BY-NC-ND 4.0