Electronic Supplementary Material (ESI) for Lab on a Chip
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Electronic Supplementary Information for

Array-Based Capture, Distribution, Counting and Multiplexed Assaying of Beads on a Centrifugal Microfluidic Platform

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Fabrication Process

Master Fabrication

Moulds for PDMS (Polydimethylsiloxane, Sylgard 184, Dow Corning GmbH, Germany) casting were manufactured by lithographic structuring of SU8 3025 photoresist (Microchem, USA) and WBR2100 dry film photoresist (DFR) (DuPont, USA). To this end, first a layer of SU8 3025 was spin-coated on a clean silicon wafer, soft-baked on a levelled hot plate and exposed to UV light. After UV exposure, post exposure bake was performed and unexposed resist was removed using standard developer solution. The wafer was then rinsed with clean developer, followed by Isopropanol (IPA) and dried with pressurized nitrogen. The wafer was then baked on a hot plate for 1 minute. Subsequently, 2 layers of DFR were laminated on top of the SU8 3025. The DFR was then exposed to UV light to create the second layer of the mould. Then the DFR was placed on a hot plate, followed by removal of unexposed resist in a bath of 1.6 % K_2CO_3 in DI water. Table 1 summarizes the process parameters.

Table 1: Process parameters for mould fabrication

Layer	#	Step	Parameters
1	1	Clean Wafer	DI water and IPA, dry with N_2
SU8 3025	2	Spin Coating	2500 RPM => 30 µm thickness
	3	Soft Bake	14 min @ 95°C on Hot Plate
	4	Exposure Level 1	Exposure energy: 280 mJ cm^{-2}
	5	Post Exposure Bake	3 min @ 95°C
	6	Develop	10 min. in standard SU8 Developer
	7	Rinse	Rinse with fresh SU8 Developer
	8	Rinse	IPA, dry with N_2
	9	Hard Bake	1 min @ 150°C on Hot Plate
2	10	Laminate WBR2100 (2x)	Roll Temperature: 95°C
WBR2100	11	Alignment 2nd Layer and Exposure	Exposure energy: 440 mJ cm^{-2}
	12	Pose Exposure Bake	55 s @ 100°C
	13	Develop	20 min in 1.6 % K_2CO_3
	14	Rinse	DI water

Surface Coating

In order to facilitate release of the PDMS slab from the mould, the surface was treated with a hydrophobic coating. To this end the mould was immersed in a bath of 10-mM Octadecyltrichlorosilane (Sigma Aldrich, IRELAND) in anhydrous Hexane (Sigma Aldrich, IRELAND) for 2 hours. The mould was subsequently rinsed with Methanol and baked for 1 hour at 100 ºC on a hot plate. This resulted in coating with a water contact angle > 100 º.

PDMS Replication

The microstructures on the mould were replicated in PDMS to create functional chips. PDMS was mixed in a ratio of 1:5 (curing agent : base), poured onto the mould and degased under vacuum for 30 minutes to remove entrapped air. Next, the PDMS was cured in an oven at 85 ºC for 15 minutes. The PDMS was then cut to disc shape and access holes were punched. PDMS with a mixing ratio of 1:20 (curing agent : base) was then spin-coated at 1000 rpm on a PMMA (Poly(methyl methacrylate, Radionics, IRELAND) disc and cured in the oven at 85 ºC for 30 minutes. Afterwards the PDMS coated PMMA disc was treated with O_2 plasma for 5 minutes. After the plasma treatment both PDMS pieces were aligned, bonded and placed in the oven at 85 ºC for at least 3 hours.

The whole manufacturing process is summarized in Fig. 1.

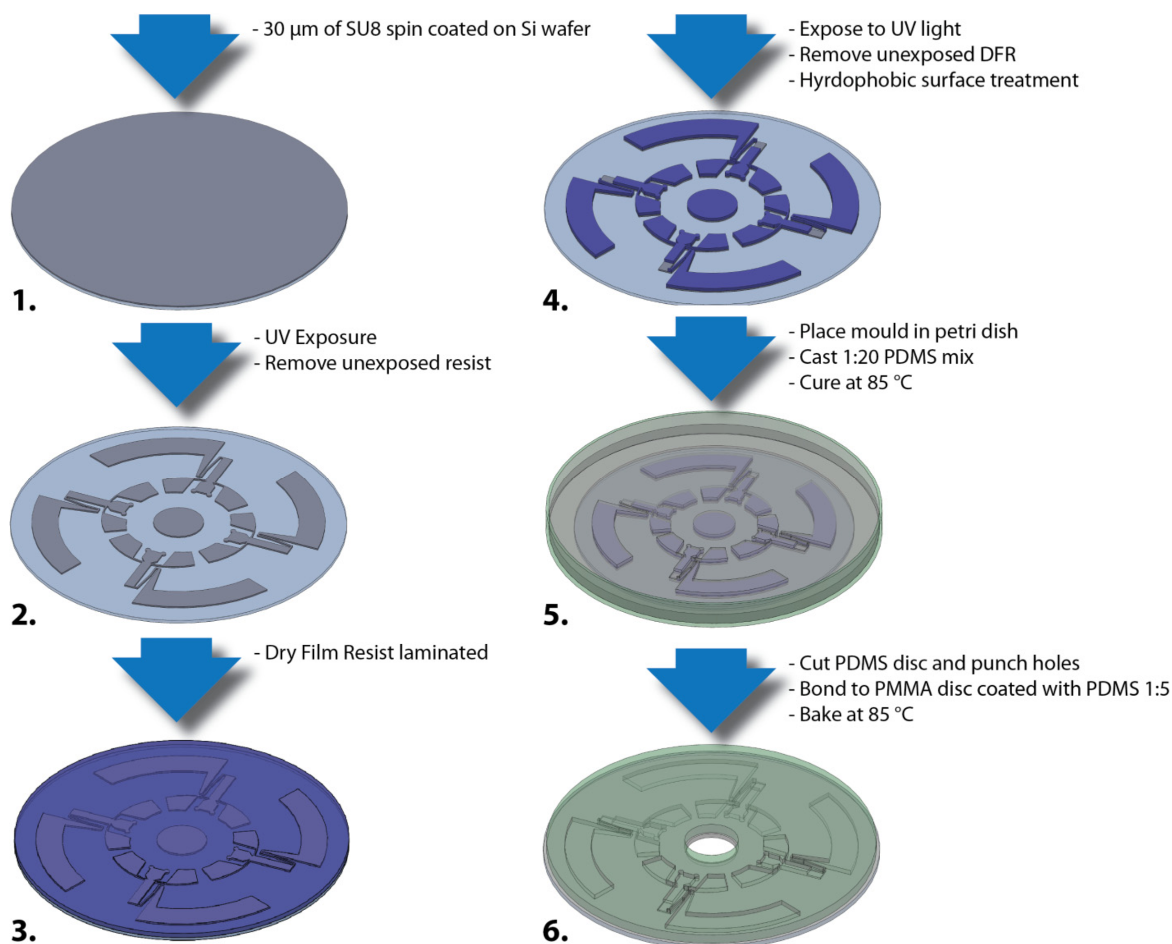

Figure 1: Summary of fabrication process. Fabrication of mould using SU8 and dry film resist (1 – 4). PDMS is cast on the mould (5.) and the disc subsequently assembled (6.).