Electronic Supplementary Material (ESI) for Soft Matter

Experimental

Fabrication of wrinkled PDMS film

PDMS (sylgard 184, Dow Corning) and the curing agent were mixed in a weight ratio of 10:1, followed by curing at 65°C for 4hrs. The water advancing contact angle on freshly prepared samples was θ_a=115°. The rectangular PDMS strips (40 mm x 15 mm) were stretched uniaxially using a custom-designed stretching device to a certain strain (from 0 to 25%). The stretched samples were exposed to O_2 plasma cleaner (Harrick plasma, PDC-32G) or UVO cleaner (model 144AX, Jelight Company, Inc.) to generate a thin layer of oxide. Upon releasing of the strain wrinkles were formed with wavelengths dependent on the applied strain, oxidation time and intensity. For the plasma cleaner, the pressure inside the chamber was kept at 0.1 Torr, and the plasma power was 100W. The time of exposure was varied between 20 min and 1h. Silicon wafers (p type semiconductor (100) from Wafer World Inc.) used in dip coating as donor/receiver substrates were treated with a 5:1 H_2SO_4:H_2O_2 Piranha solution for 10 minutes, followed by a O_2 plasma treatment (Harrick plasma, PDC-32G) for at least 3 minutes.

Selective deposition of colloidal particles

Colloidal solutions (30 wt%) of silica nanoparticles (70-100 nm) in isopropanol (30% wt-IPA-ST-ZL) were purchased from Nissan Chemical. For dip coating, the silica nanoparticles were diluted in ethanol to 1 wt%. The particles were selectively deposited inside the grooves of the PDMS wrinkles using a dip coater (Nima Tech.) through a slow and vertical withdrawing from the solution at various speeds ranging from 10mm/min to

30 mm/min. To minimize the hydrophobic recovery of PDMS films, the nanoparticles were dip-coated right after the plasma or UVO exposure. Nanoparticles were also dip-coated onto flat PDMS films and/or silicon wafers to serve as ''nanoparticle donor substrates''.

Transfer printing of silica nanoparticles

In order to assemble the nanoparticles on the PDMS ridges only, we wrapped up the hydrophilic (UVO treated) wrinkled PDMS film (the "receiver substrate'') on a cylindrical lint roller (3M) coated with a thin layer of adhesive. This overall assembly was then rolled (30 cm/s) on a flat PDMS or silicon wafer ("donor substrates'') that was dip-coated with nanoparticles to pick up the nanoparticles. The cylinder was rolled again on top of a second receiver substrate enabling the transfer/release of the nanoparticles as 1D line patterns matching the winkled template. 2D nanoparticles patterns were generated by repeating the above rolling and printing steps.

Substrate characterization

The samples were characterized by scanning electron microscopy (SEM). Images were taken with an FEI Strata DB325 focused ion beam (FIB) (PENN Regional Nanotechnology Facility, Philadelphia) in high vacuum mode with an acceleration voltage of 5KV.