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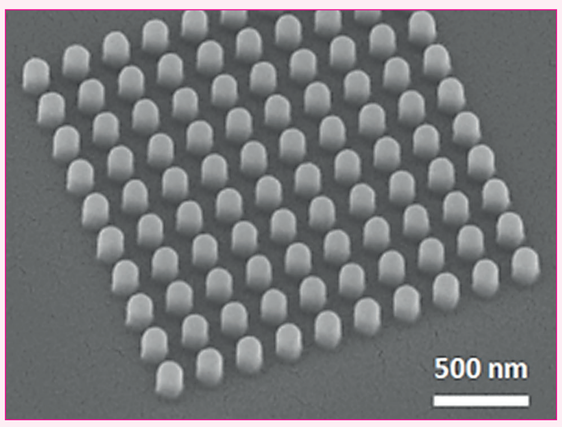
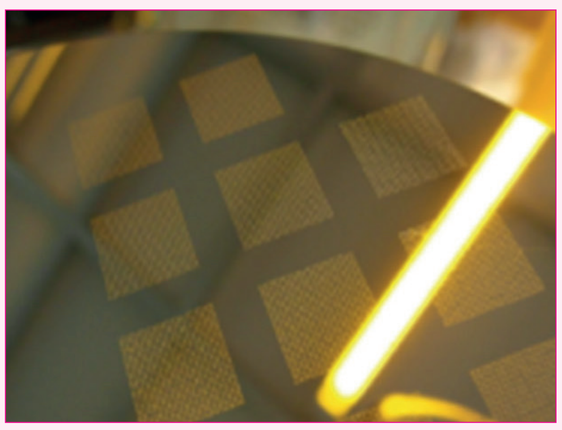
mr-UVCur26SF - A Solvent-Free Low Viscous Photo-NIL Resist

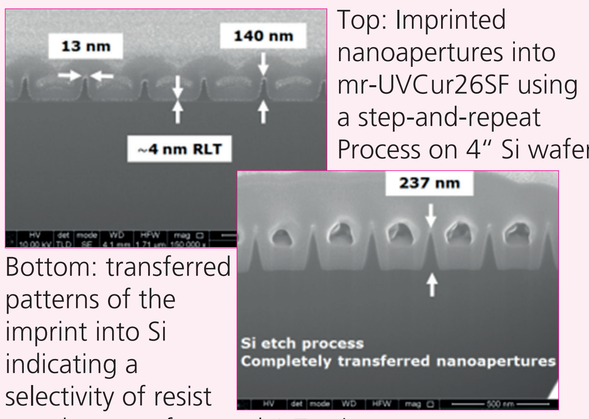
Applicable by Inkjet Dispensing and in Roll-to-Roll NIL Processes



mr-UVCur26SF imprint of a pillar array on 2“ Si wafer, pillars 75 nm in diameter, 200 nm in height (Courtesy of HZB, Germany)



Discrete areas of mr-UVCur26SF droplets inkjet dispensed on a 6“ Si wafer matching the template architecture for S&R repeat NIL (Courtesy of FhG IISB, Germany)



Top: Imprinted nanoapertures into mr-UVCur26SF using a step-and-repeat Process on 4“ Si wafer

Bottom: transferred patterns of the imprint into Si indicating a selectivity of resist to substrate of around 1.7 using ICP with HBr plasma

(Courtesy of FhG IISB, Germany)

Unique Features

- Organic, photo-curable nanoimprint resist for inkjet dispensing
- Excellent imprint characteristics
- Compatibility to various mold materials: Ni, Si, OrmoStamp®
- High stability of the cured patterns
- Excellent dry etch resistance for pattern transfer
- Transparent for UV/vis > 350nm

Inkjet Dispensing

- Low viscosity (15 mPas)
- Liquid formulation (solvent-free)
- Broad compatibility with commercial inkjet tools and printheads
- Proved droplet volume stability over a period of 300 s @ RT

Applications

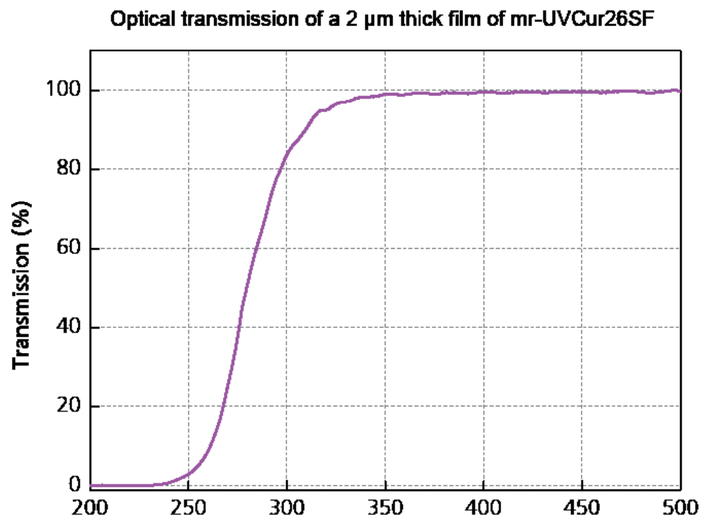
- Step&Repeat NIL process
- Large-area nanostructuring of flexible substrates
- Continuous roll-to-roll (R2R) Photo-NIL processes
- High volume manufacturing of
  - Antireflective coatings
  - (Super)Hydrophobic patterns on flexible substrates
  - Wire-grid polarizers

Roll-to-Roll NIL

- Good adhesion to plastic foil substrates
- Ultra-high photocuring rate enabling high roller speeds and high throughput
- R2R web speeds up to 30 m min^{-1} demonstrated
- Constantly high pattern fidelity at various throughput rates

Commercial inkjet printheads featuring different nozzle numbers applied for dispensing of mr-UVCur26SF

Inkjet printhead	Manufacturer	Nozzle no.	Temperature
MJ-ABP-01-50	MicroFab	1	25 °C
Spectra SL-128	FujiFilm Dimatix	128	25 °C
Spectra SM-128	FujiFilm Dimatix	128	25 °C
Sapphire QS-256/30	FujiFilm Dimatix	256	25 °C
Polaris PQ-512/15	FujiFilm Dimatix	512	25 °C
KM1024	KonicaMinolta	2 x 512	25 °C - 40 °C
DMP 2831 equipped with DMC-11610 or DMC-11601	FujiFilm Dimatix	16	25 °C

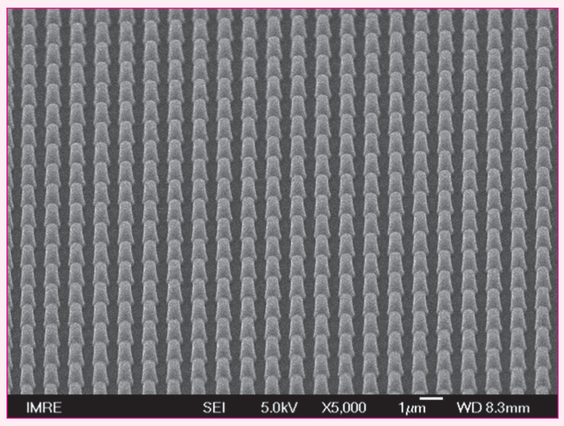


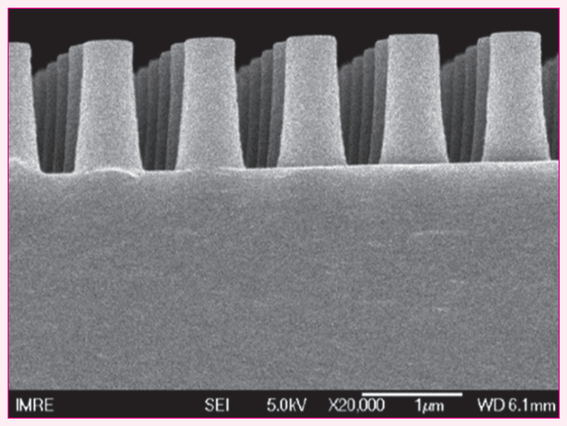


Antireflective coating on PC with mr-UVCur26SF: moth-eye pattern imprinted on PC foil in a R2R-NIL process (Courtesy of IMRE, Singapore)



R2R-NIL on PC foil: AR1 L&S pattern, 500 nm pitch, inkjet dispensed mr-UVCur26SF, pristine Ni roller molds, 405 nm LED radiation, throughput speed 10 m min^{-1} (machine limit). Inset: SEM image of the imprint (Courtesy of IMRE, Singapore).





R2R UV-NIL imprinted dense pillar design, 500 nm in diameter, aspect ratio > 2, deposition of mr-UVCur26SF was done via inkjet dispensing at room temperature. (Data courtesy of IMRE, Singapore)