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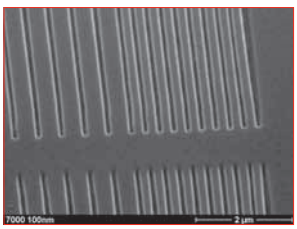
Thermoplastic Polymers for Nanoimprint Lithography

micro resist technology provides different series of thermoplastic polymers

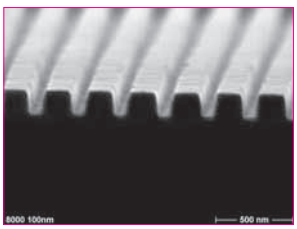
	mr-I 7000E	mr-I 8000E	mr-I T85	mr-I PMMA
Glass transition temperature	T_g 60 °C	T_g 115 °C	T_g 85 °C	T_g 105 °C
Imprint temperature	125 - 150 °C	170 - 190 °C	130 – 150 °C	150 - 180 °C
Imprint pressure	20 - 50 bar		5 - 20 bar	50 bar
Ready-to-use solutions for various film thicknesses (3000 rpm)	mr-I 7010E 100 nm mr-I 7020E 200 nm mr-I 7030E 300 nm	mr-I 8010E 100 nm mr-I 8020E 200 nm mr-I 8030E 300 nm	mr-I T85-0.3 300 nm mr-I T85-1.0 1.0 µm mr-I T85-5.0 5.0 µm	100 nm 300 nm 500 nm
Unique features	• Excellent film quality • Plasma etch resistance superior to PMMA • Attainable smallest feature size at least 50 nm (depending on stamp resolution) • Safe solvents • Low imprint pressure • Low residual layer tickness • Short cycle times due to faster imprint		• Unpolar thermoplastic • Excellent film quality • Beneficial flow behaviour during imprinting, low imprint pressure • Excellent UV and optical transparency • High plasma etch resistance comparable to novolak-based photoresists • High chemical stability	• Excellent film quality • Attainable smallest feature size at least 50 nm (depending on stamp resolution) • Safe solvents • Low molecular weights (35k, 75k)
Main applications	• Etch mask for pattern transfer • Mass data storage • Nano-optical devices • Photonic crystals • Micro displays • Bio applications • Microelectronics		• Microoptical elements • Wave guides • Bio applications • Lab-on-a-chip systems • Microfluidics • Pattern transfer	• Fundamental investigations

mr-I 7000E



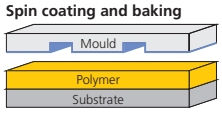
100 nm trenches, 300 and 500 nm pitch,
Film thickness: 200 nm
Imprint: 130 °C, 3 min, 50 bar
Complete filling of stamp cavities
Residual layer thickness < 10 nm

mr-I 8000E



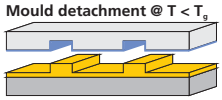
100 nm trenches, 300 nm pitch ,
Film thickness: 200 nm
Imprint: 190 °C, 3 min, 50 bar
Complete filling of stamp cavities
Residual layer thickness < 10 nm

Spin coating and baking

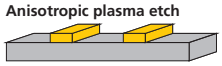


Nanoimprinting @ T > T_g

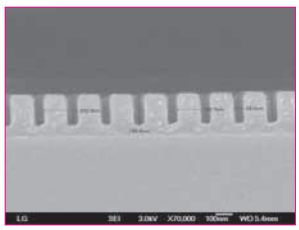
Mould detachment @ T < T_g



Anisotropic plasma etch

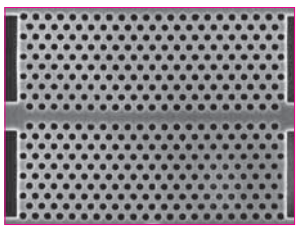


mr-I 8000E



60 nm trenches, 200 nm pitch ,
Film thickness: 200 nm
Imprint: 135 °C, 2 min, 45 bar
Complete filling of stamp cavities
(Courtesy of LG Elite, Korea)

mr-I T85



Photonic wave guide filter fabricated using mr-I T85, 320 nm deep holes transferred into silicon (200 nm diameter)
(Courtesy of MIC / TU Denmark)

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