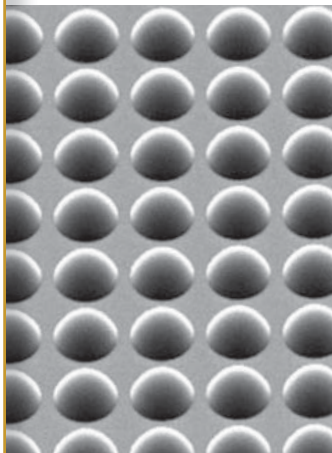


micro resist technology

Gesellschaft für chemische Materialien spezieller Photoresistsysteme mbH

UV-Curable Hybrid Polymers for Micro Optics



- OrmoComp
- OrmoClear
- OrmoStamp
- OrmoCore
- OrmoClad

Unique features

- Excellent transparency
- Excellent mechanical properties
- High chemical and physical stability
- Excellent pattern transfer fidelity
- Ready-to-use solutions
- Solvent-free



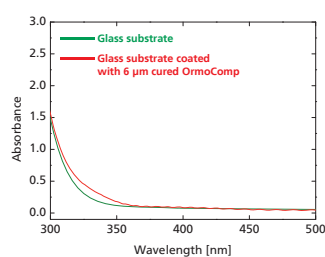
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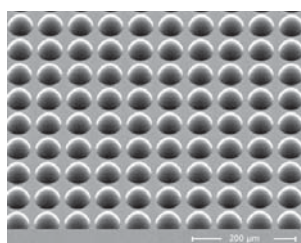


OrmoComp and OrmoClear for Micro-Optical Components

Properties of cured material	OrmoComp	OrmoClear
Thermal behaviour	Duromeric	
Shrinkage (during curing)	5 – 7 % by volume	3 – 5 % by volume
CTE (20 – 100 °C)	60 ppm K ⁻¹	100 – 130 ppm K ⁻¹
Refractive index @ 635 nm @ 810 nm	1.518 – 1.520 1.512 – 1.513	1.553 – 1.554 1.545 – 1.546



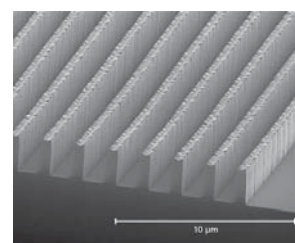
Optical transparency of OrmoComp



Replicated OrmoComp 10x10 micro lens arrays



Replicated refractive microlenses on a VCSEL wafer substrate (Courtesy of Avalon)



Optical grating (Courtesy of FSU Jena)

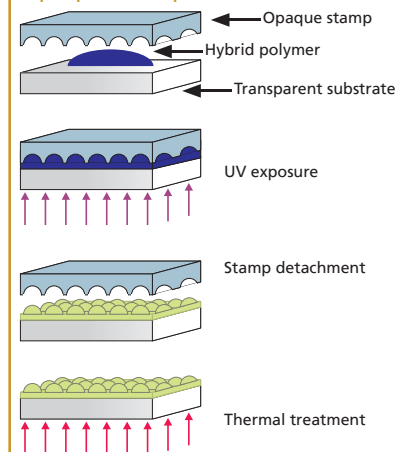
OrmoComp to process by imprinting or UV moulding

- Exposure: i-line, h-line, broadband
- Fast curing
- Highly transparent for near UV and visible light down to 350 nm
- High resolution to sub-100 nm line width
- Water absorption < 0.5 %
- Roughness 2 – 4 nm
- High mechanical and thermal stability
- 6 months shelf life
- Solvent-free

Main applications

- Moulded gratings
- Micro lenses
- Micro lens arrays
- Optical couplers and connectors
- Prisms

Process flow Opaque Stamp



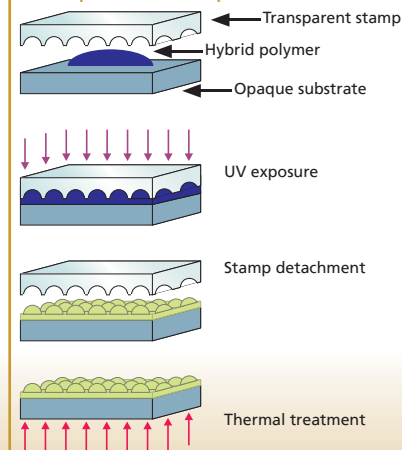
OrmoClear to process by imprinting or UV moulding

- Exposure: i-line, h-line, broadband
- Fast curing
- Highly transparent for near UV and visible light down to 350 nm and at the datacom and telecom wavelengths
- High mechanical and thermal stability
- Binary and continuous profile
- 6 months shelf life
- Solvent free

Main applications

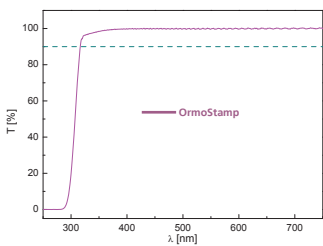
- Positioning and mechanical alignment features in one mould
- Single elements or wafer scale

Process flow Transparent Stamp

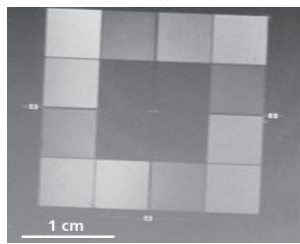


OrmoStamp for Transparent Stamp Fabrication

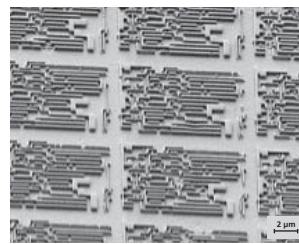
Properties of cured material	OrmoStamp
CTE (20 – 100 °C)	105 ppm K ⁻¹
Elasticity modulus	0.650 GPa
Hardness	0.036 GPa
Refractive index @ 635 nm @ 810 nm	1.504 – 1.508 1.500 – 1.503



Optical transparency of OrmoStamp



OrmoStamp mould on glass backplane (Courtesy of Profactor e.V.)



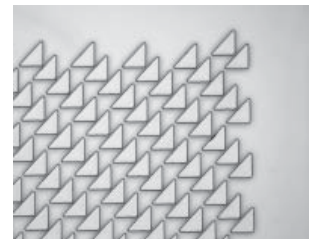
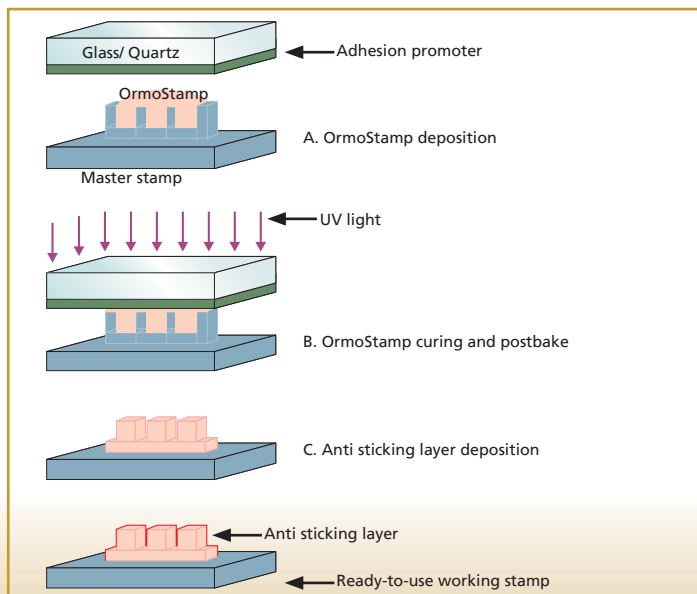
Nanostructures (60 nm smallest), OrmoStamp-SFIL-Stamp, (Courtesy of University of Cardiff)



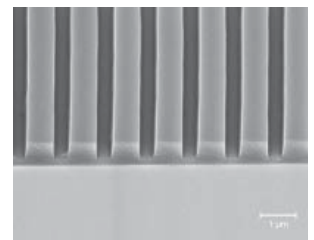
mr-UVCur06 structures (32nd imprint done with an OrmoStamp mould)

OrmoStamp to process by UV moulding

- Cost-efficient alternative to quartz stamps
- Excellent fidelity to the master stamp
- Highly transparent for visible light down to 350 nm
- High resolution to sub-100 nm linewidth
- Convenient processing with standard lithography equipment
- Mechanically stable
- High thermal stability
- One-step or two-step stamp fabrication



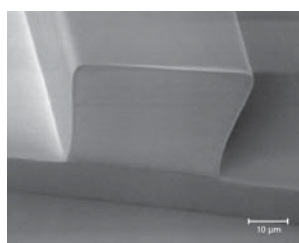
Microstructures replicated with an OrmoStamp mould



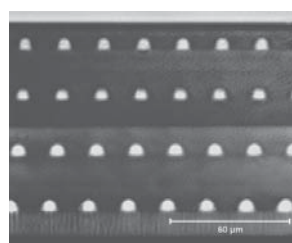
mr-UVCur06 nanostructures imprinted with an OrmoStamp mould

OrmoCore and OrmoClad for Optical Wave Guide Fabrication

Properties of cured polymer	OrmoCore	OrmoClad
Film quality	Good planarisation properties	
Water absorption	< 0.5 %	
CTE (20 – 100 °C)	100 – 130 ppm K ⁻¹	
Rms roughness	10 – 15 nm	
Shrinkage (during curing)	2 – 5 % by volume	
Refractive index @ 635 nm	1.552 – 1.553	1.533 – 1.534
@ 810 nm	1.545 – 1.546	1.524 – 1.526



Undercladding/ core of a multimode wave guide on silicon (Courtesy of ACREO)



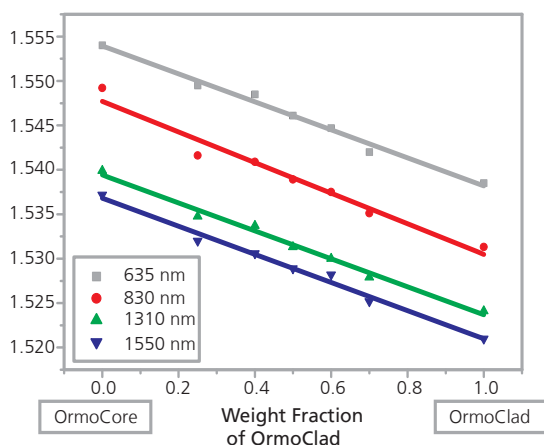
Multilayer optical fan-out (Courtesy of FHG - IOF/ Jena)

OrmoCore and OrmoClad to process by conventional lithography or UV moulding

- Exposure: i-line, broadband
- Tunable refractive index (Core/ Clad)
- Low optical loss at datacom wavelengths
- High mechanical and thermal stability
- 6 months shelf life

Main applications

- Single-mode wave guides
- Multi-mode wave guides
- Beam splitters
- Thermo-optical switches



Refractive index tuning

Process flow for optical wave guides

