

NEWS 2006

micro resist technology GmbH coordinates NaPa sub-project „Materials“

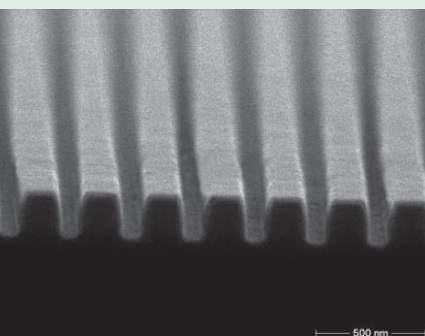
micro resist technology GmbH has been designing and fabricating advanced polymers for nanoimprint lithography (NIL) in recent years and acquired profound knowledge in resist and polymer development and high international reputation as a manufacturer of these materials. Managing Director Gabi Gruetzner and Technical Director Dr. Freimut Reuther lead the Materials Subproject of the European Integrated project Emerging Nanopatterning Methods (NaPa), Contract No NMP4-CT-2003-500120, funded within Priority 3 of the Sixth Framework Programme of the European Commission.

The NaPa Consortium is composed of 35 teams from 14 countries belonging to the leading nanofabrication laboratories and companies in Europe. It has the mission to develop a library of processes for nanopatterning based on novel methods like NIL, soft lithography, self assembly, stencilling, scanning probes and UV NIL.

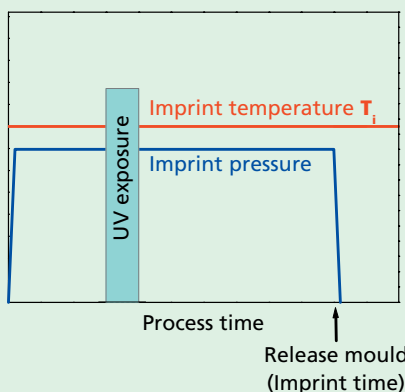
The Materials subproject designs and supplies tailored multifunctional materials to fulfil the needs of the new patterning methods. The main emphasis has been until now on materials for NIL. Fundacion CIDETEC, Spain (development of functionalized polymers), Fundacion Inasmet, Spain (surface modification), Istituto per i Processi Chimico Fisici sezione di Bari Consiglio Nazionale delle Ricerche, Italy, (development and incorporation of nanoparticles into polymers for nanoimprint lithography) and Institute of Microelectronics Technology, Russian Academy of Sciences, Russia (nanorheological investigations), Tyndall National Institute University College Cork (nanoimprinting), Warsaw University of Technology, Poland (nanorheological investigations) are the members of the Materials subproject. First results of the mrt's investigations in the project are new thermoplastics mr-I 7000E and mr-I 8000E with improved imprint behaviour and the photochemically curing polymer mr-NIL 6000 for thermal nanoimprint lithography.

For further information please visit the NaPa website
www.NaPaI.org

NaPa
Emerging Nanopatterning Methods



100 nm trenches, 300 nm pitch



Imprint process with flood exposure and PEB during imprinting

mr-NIL 6000 – high performance photochemically curing resist for thermal Nanoimprint Lithography

Now our company provides mr-NIL 6000 – a **new** photochemically curing resist for thermal Nanoimprint Lithography. The resist forms solid films after spin-coating and prebake. Its low glass transition temperature (T_g) of 40 °C enables imprinting at moderate temperatures. Curing of the resist by UV exposure and post exposure bake (PEB) is carried out for obtaining the thermal stability required for subsequent processing. This is beneficially done during the imprint process by UV flood exposing in the machine at the imprint temperature, but is also practicable subsequent to the imprint outside the machine. Optimal are imprinters combining thermal imprinting and UV exposure. The increase in T_g of the resist during curing in the imprinter allows mould releasing at the imprint temperature and hence an isothermal imprint process. Features of excellent quality and minimum residual layer thickness < 10 nm are obtained. The resist exhibits high wet and dry etch resistance. mr-NIL 6000 is well suitable for both pattern transfer and permanent applications e.g. in micro-fluidics and photonic crystals.

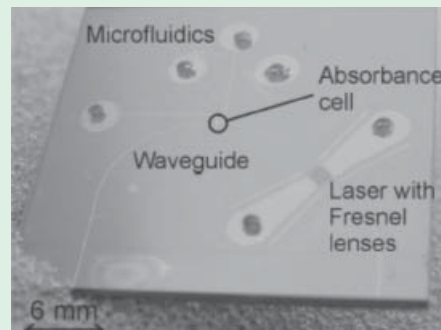
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mr-I T85 – New thermoplastic polymer series for NIL

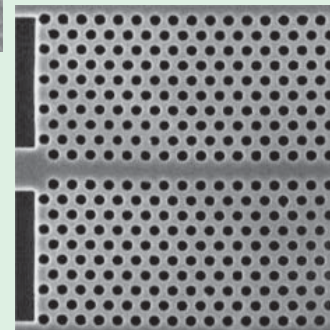
The **new** mr-I T85 series has been developed preferably for permanent applications in lab-on-a-chip systems, microfluidics, and microoptical components. The main features of this polymer are

- unpolar thermoplastic
- excellent UV and optical transparency
- high chemical stability and high resistance to acids, bases, and polar solvents
- beneficial flow behaviour during imprinting, low imprint pressure
- high plasma etch resistance

Feature sizes can be imprinted ranging from sub-100 nm to 100 µm. micro resist technology provides ready-to-use solutions for film thicknesses from 100 nm to 20 µm.

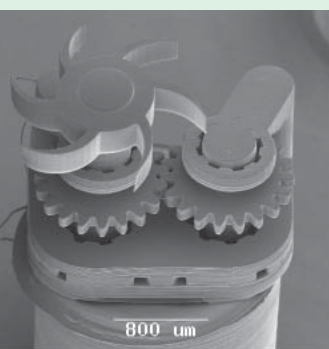


Complete lab-on-a-chip device for absorption measurements, all components imprinted in one layer of mr-I T85

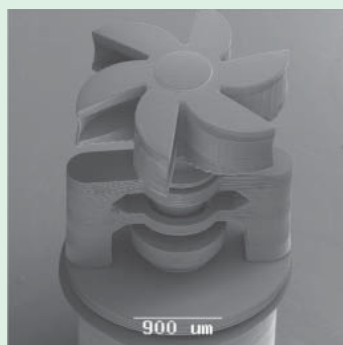


Photonic wave guide filter fabricated using mr-I T85, 320 nm deep holes transferred into silicon (200 nm diameter)

(Courtesy of MIC / TU Denmark)



Windmill for fluidic media with a gearwheel connection



Windmill with cavities

(Courtesy of Laser Zentrum Hannover)

3-D lithography for micro machining

An ORMOCER®-based material system for 3-D micro fabrication has been developed by micro resist technology GmbH together with Laser Zentrum Hannover and other partners in a recently finished research project funded by the European Commission (PRONTO). The technology is similar to classical rapid prototyping, whereas the resolution has been improved to sub 10 µm. In the µ-stereo lithography setup, the 3D structure is created through layer by layer laser direct writing. This innovative technology enables the low cost fabrication of complex micro mechanical systems for applications in sensors, micro machining, microfluidics and medical and bioapplications. Within the project micro mechanical demonstrators were developed and fabricated. Examples are shown left. The µ-stereo lithography technology enables the parallel production of several parts in the same fabrication step and is so bridging the gap between prototyping and mass fabrication.

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