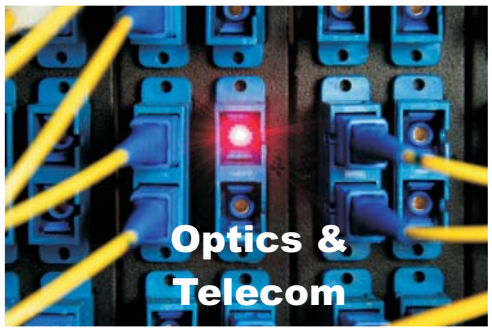
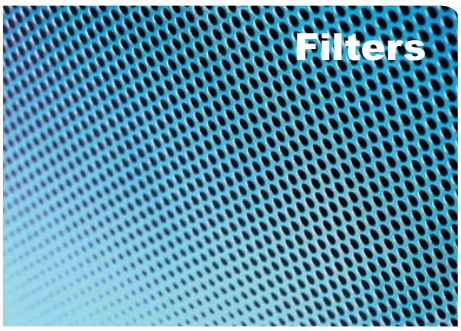
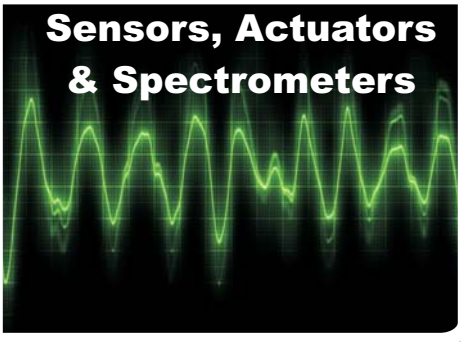
nanoscale

PATTERNS & STRUCTURES

NANOIMPRINT
STAMPS
PROCESSING
E-BEAM







www.nilt.com

NIL TECHNOLOGY

NILT YOUR PREFERRED NIL STAMP PARTNER

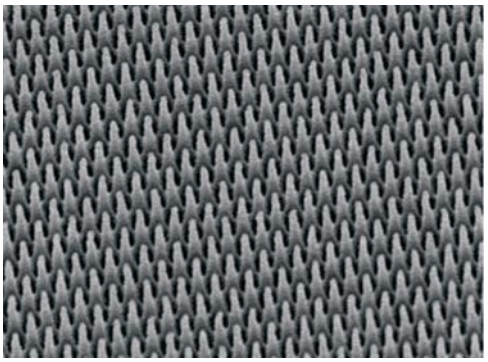
NIL Technology (NILT) specializes in patterning and fabrication of nano-scale structures. The patterning is realized by nanoimprint lithography (NIL), electron beam lithography, and advanced processing techniques.

Nanoimprint lithography applies a stamp or template with structures to be replicated in an imprinting process, combining the precision of electron beam lithography with fast parallel production. NILT has experience in meeting complex demands for research and new product development activities and support customers in all stages from design considerations to production.

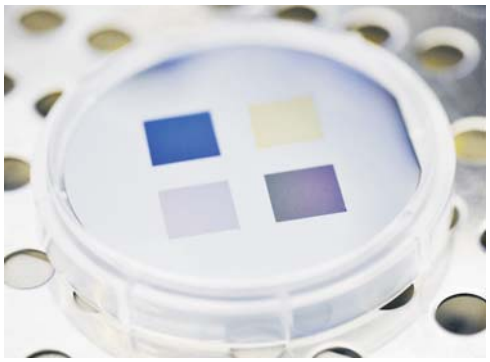
The NILT team consists of highly motivated and skilled engineers striving for delivering high-quality one-stop solutions.

STANDARD STAMPS GAIN NANOIMPRINT EXPERIENCE

NILT Standard Stamps are stamps with fixed patterns defined by NILT. Standard stamps are ideal for testing and process optimization. Below is two examples of NILT Standard Stamps.
Check **www.nilt.com/standardstamps** for other types.



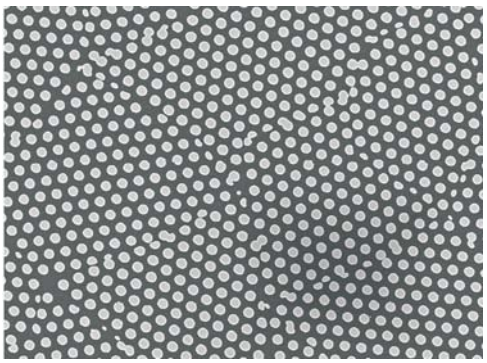
Anti-reflective standard stamp (250 nm pitch)



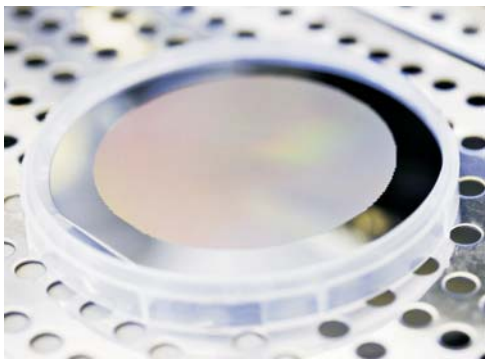
2” Photonic standard stamp (200-500 nm pillars)

CUSTOM STAMPS FOR YOUR NEXT GENERATION PRODUCTS

NILT Custom Stamps are stamps engineered according to customer specifications and design. The stamps are suitable for application developments and prototyping. NILT fabricates stamps for all commercially available NIL tools. Check **www.nilt.com/customstamps** for additional info.



Domain clustered pillars (150 nm pillar diameter)



Corresponding 4” wafer-scale stamp

NANOIMPRINT FROM R&D TO PRODUCTION

Through access to state-of-the-art cleanrooms NILT is capable of providing nanostructured substrates and high-quality imprinting in both small and large volumes.

Since imprint quality is strongly related to stamp quality, NILT Stamps are fabricated using state-of-the-art 100 keV, Gaussian as well as shaped E-Beam tools to ensure highest quality.

Based on customer design, NILT handles all issues from stamp design considerations to choice of imprint polymers and imprint process. NILT provides both thermal and UV nanoimprint lithography, Step & Repeat UV imprinting and wafer-scale imprints.

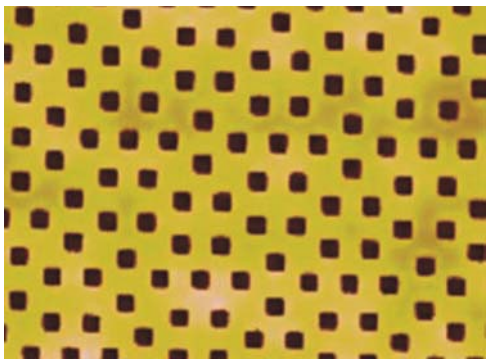
Standard formats include:

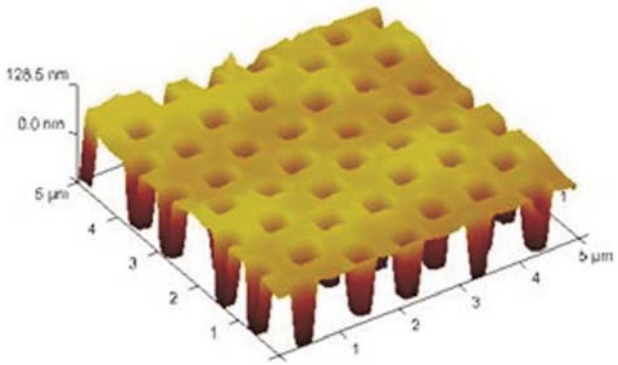
- 2", 3", 4" and 6" round wafer sizes
- Thickness up to 2 mm
- 6" x 6" x 0.25" mask blanks

Examples of imprint substrates include:

- Silicon
- Quartz
- GaAs / GaN

Imprint example

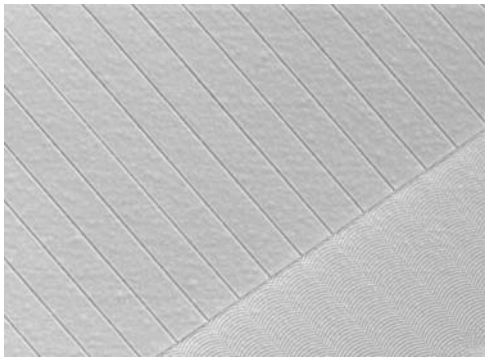


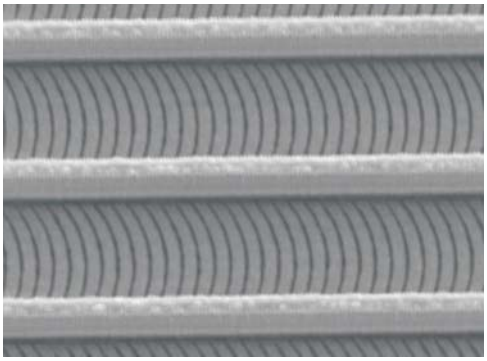


AFM scan of imprinted holes in a polymer on a silicon surface. 350 nm wide holes with 350 nm spacing.

Processing example

Below, two SEM images of "butterfly wing" structures fabricated by multiple e-beam lithography steps. The nanostructures are made in poly-silicon and are hanging above the surface of the substrate.





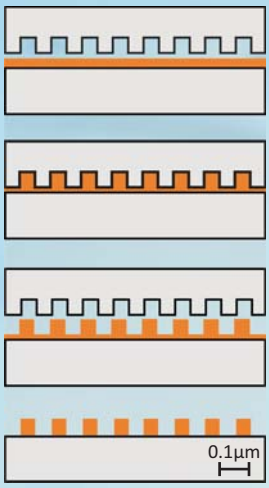
NIL TECHNOLOGY

NANOIMPRINT LITHOGRAPHY PRODUCTION OF NANOSCALE PATTERNS

NIL is to volume production of nanometer sized patterns, what the Guttenberg press was for the printed media. It is a highly precise nano-manufacturing technique to replicate nanostructures – replication of sub-10 nm features has been achieved.

The strength of nanoimprint lithography is the combination of slow but high precision electron beam lithography and fast parallel production. Electron beam lithography is used to fabricate a high precision stamp subsequently used in a fast parallel nanoimprint process for replication of the stamp pattern. In this way the precision of electron beam lithography is transferred to cost-effective volume production.

NIL process illustration



A stamp and a substrate coated with thermal NIL polymer (orange) are prepared

The polymer is heated to a temperature above the glass transition temperature of the polymer, and the stamp is imprinted into the polymer

When the stamp is filled with polymer, the polymer is cooled down, and the stamp is separated from the imprinted polymer

The polymer residual layer is removed

APPLICATIONS EXPLOITATION OF NANO-SCALE STRUCTURES & PATTERNS

Nano-scale patterning and nanostructures enable the creation of products with entirely new properties and functionalities. It gives rise to developments of new devices e.g. photonic crystal structures for LEDs, and to developments where nanostructures per se constitute new functionality e.g. topography for cell growth, self-cleaning or anti-reflective structures. Below, there is given examples of devices and functionalities.

CATEGORY	DEVICE	DEVICE-SPECIFIC FUNCTIONALITIES
Displays	Nano-wire grid polarizers, Anti-reflective displays	Improve contrast, Anti-reflection
Optics & Telecom	LEDs, Lens arrays, Photonic crystals, Lasers	Beam-shaping, Light guiding, Increase brightness of LEDs
Bio-devices	Lab-on-a-chip, Optical gratings, Engineered substrates	Drug research, Blood analysis, Facilitate cell growth
Other	Sensors, Actuators, Spectrometer	Resonance of e.g. wave functions, Cell identification
	Filters	Purification, Desalination, Wavelenght filtration

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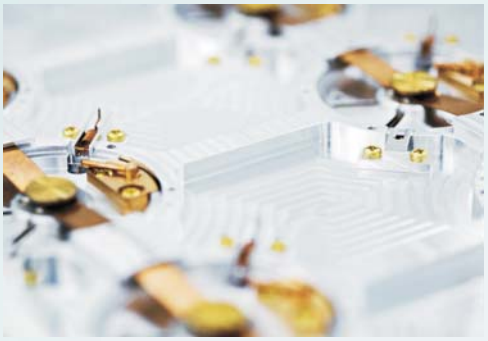

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