

WORKSHOP on

Maskless Direct-Write Technologies for the Advanced Micro & Nano-Fabrication

Organized by Heidelberg Instruments in collaboration with Center for Nano Science and Engineering, IISc, Bengaluru

18th Dec 2023 from 09:00 am to 01:30 pm @CeNSE Seminar Hall



About the Workshop: The workshop aims to bring together experts, researchers, young scientists, and academicians to disseminate knowledge from interdisciplinary backgrounds. The workshop will provide an opportunity to discuss recent developments in Direct Write Lithography research and foster future directions in Nano & Micro device making. The workshop is being organized by Heidelberg Instruments Mikrotechnik GmbH, a pioneer in Direct write maskless lithography Technology developer along with CeNSE, IISc Bangalore. This program offers a forum where you may share compelling key developments in the field of Lithography for R&D and even for Production scale.

Program Agenda

09:00 AM – 09:30 AM	Registration
09:30 AM – 10:00 AM	Inauguration and Introduction by Prof. Shankar Kumar Selvaraja, CeNSE, IISc-Bangalore
10:00 AM – 10:45 AM	Heidelberg Instruments – Company and Product Overview – Focus on Maskless Aligner and Maskless Stepper by Dr. Sven Preuss Heidelberg Instruments
10:45 AM – 11:15 AM	Empowering microfabrication research with the DWL66+ and unveiling the potential of grayscale lithography by Dominique Collé, Heidelberg Instruments
11:15AM-11:30AM Coffee/Tea Break	
11:30 AM – 12:00 PM	Laser lithography 2D and 3D corrections by Dmitri Titko, GenISys
12:00 PM – 12:30 PM	NanoFrazor Lithography for advanced 2D&3D nanodevices by Vasileios Theofylaktopoulos, Heidelberg Instruments
12:30 PM – 01:00 PM	Talk about Industry Tools/Applications (Focus on MLA 300, ULTRA, VPG) Mask Making by Wolfgang, Heidelberg Instruments
01:00 PM – 01:30 PM	The MPO 100: 3D Lithography and 3D Microprinting via Two-Photon Polymerization by Dr. Daniel-Alexander Braun, Heidelberg Instruments
Lunch and Networking	

Register Here
<https://forms.gle/7krNfayVn43zrb2U8>
Or Scan Below



To know more about Heidelberg Instruments



Abstracts



μ-MLA

Session 1: Heidelberg Instruments is a world leader in the design, development, and manufacture of high-precision laser lithography systems, maskless aligners, and nanofabrication tools. With over 35 years of experience and well over 1,300 systems installed worldwide, Heidelberg Instruments provides lithography solutions specifically tailored to meet the micro- and nanofabrication requirements of our global customers.

Focus on Maskless Technology (μMLA, MLA 150, VPG 300 DI):

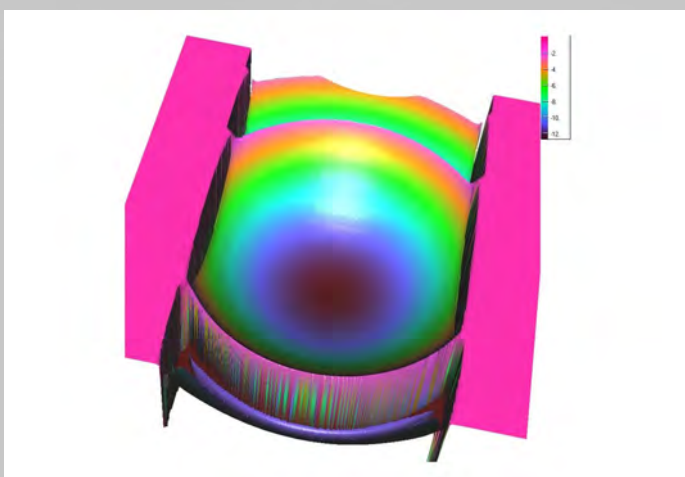
When Heidelberg Instruments introduced the Maskless Aligner in 2015, it changed the perception of maskless lithography, and the way lithography is performed in R&D facilities worldwide. This talk will present the features of our established maskless aligners and

our new maskless stepper and explain their advantages over traditional mask-based aligners and steppers.

Session 2: Functioning as an extremely versatile direct lithography tool, the DWL66+ offers the possibility to achieve high resolution (with a minimum structure size of 300 nm) and reach remarkable throughput. About 350 of these machines have been installed worldwide. They are employed for a wide variety of needs in educational institutions, research laboratories, and manufacturing sites. Their primary purpose lies in fabricating micro-devices for a diverse array of applications, including microelectronics, sensors, MEMs (Micro-Electro-Mechanical Systems), microfluidics and micro-optics. A substantial portion of the applications served by the DWL66+ revolve around 2.5D micro-optical structures. This is largely attributable to its distinctive ability for direct-write grayscale lithography, a competence for which it is a standard setter.



DWL66+

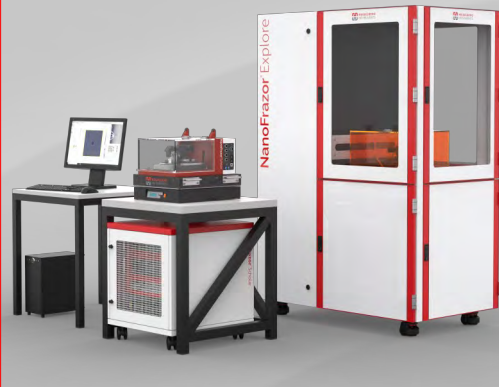
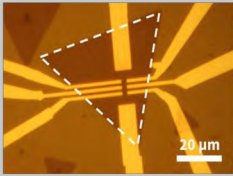


DWL66+ : Confocal microscope image of the central part of a concave Fresnel lens (diameter of the central part: 120μm, height: 11μm)



Fresnel Vertex Axicon with angles from 20°-45° with height of 10μm

Session 3: This presentation will provide overview of CD linearity and shape fidelity corrections using OPC provided by BEAMER software, as well as model-based grayscale corrections for 3D shapes.



Session 4: The NanoFrazor technology provides a fabrication platform for nanostructures of arbitrary shapes on a wide range of substrate materials. It uses thermal scanning probe lithography and direct laser sublimation. Thermal nanolithography is achieved through an ultrasharp heated tip. This is combined with in-situ real-time reading of written structures. The writing depth is actively controlled in a closed-loop system. Along with this a laser writer is integrated and can-do mix & match lithography which is helpful to make smaller to bigger structures. Applications range from nanoelectronics, photonics, spintronics to nano-bio arrays.

NanoFrazor® Explorer and NanoFrazor® Scholar

Session 5: Both throughput and cost of ownership are very important for industrial production. The maskless systems offer significant advantages over mask-based systems such as mask aligners or steppers in terms of flexibility, process results and cost of ownership. With the MLA 300, VPG and ULTRA systems, Heidelberg Instruments has developed machines that are also competitive in terms of throughput.

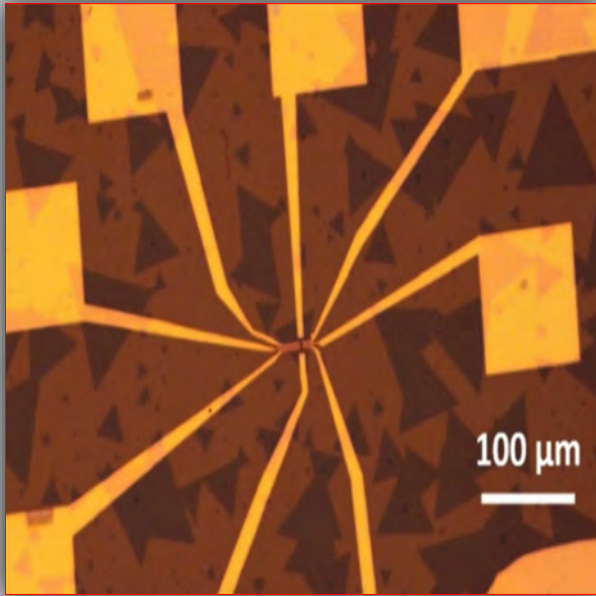


The maskless direct imager VPG 300 DI for high accuracy and high resolution microstructures

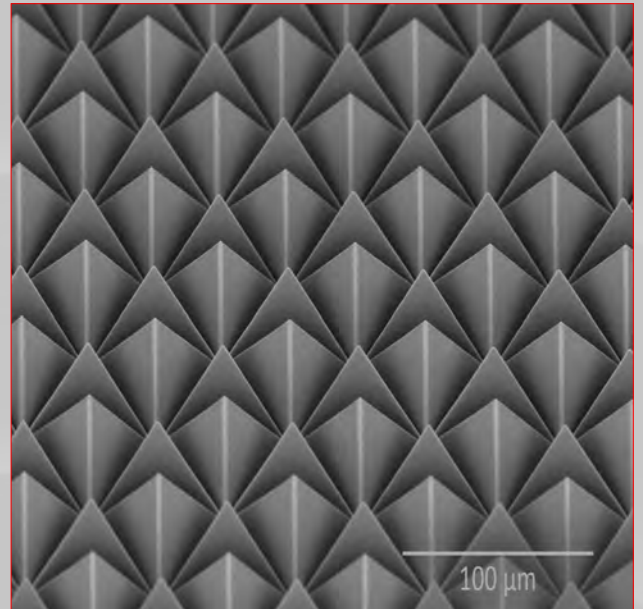


Session 6: High-precision 3D printing provides a wide range of freedom in design for many applications, like micro-optics, photonics, micro-mechanics and biomedical engineering. The modular 3D printing platform MPO 100 offers high precision on demand for 3D Lithography as well as high print volume for 3D Microprinting and enables production of complex functional microstructures. The talk will give an introduction into the technology and show examples of applications realized with the MPO 100 system.

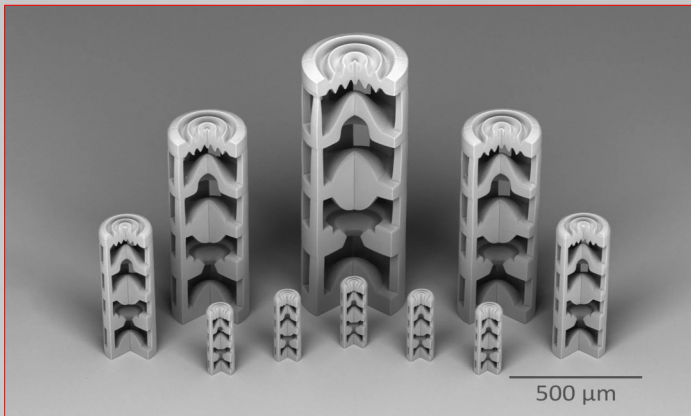
MPO100-3D Lithography and 3D Microprinting



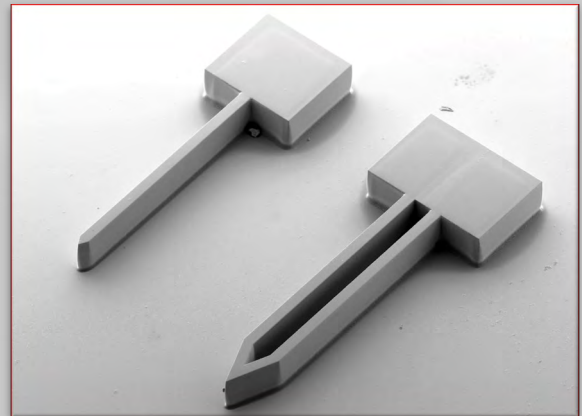
Metal contacts with vanishingly small Schottky barriers fabricated using the NanoFrazor®. On single-layer CVD-grown MoS₂. (Courtesy of Prof. Elisa Riedo, NYU, See Nat.Electr.2019)



MPO 100: Retro-reflector: Fabrication of high-quality masters used in diverse replication technologies



Lens stacks for applications in endoscopy (Life Sciences/ Biological Engineering). Novel designs can be fabricated in a single process step without the need for alignment and assembly. Fabricated with MPO100



Cantilever

Contact Details

Dr. Samik Pal
(Samik.pal@labindia.com/+91 9830383100)

Prahlada B L
(Prahlada.Bl@labindia.com/+91 7022023452)