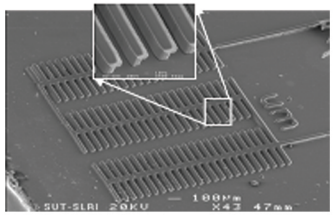
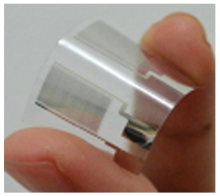
Applications

Deep X-ray lithography and LIGA with synchrotron radiation allow the production of high aspect ratio and 3D micro-structures in polymer with ideal side-wall verticality and optical quality roughness. By shadow printing an X-ray mask is copied into an X-ray sensitive resist, free lateral shape, structures heights from few microns up to several millimetres can be achieved, resulting in an open of a variety of potential applications in the field of microelectromechanical systems (MEMs), micro-fluidic devices and interconnection technology.

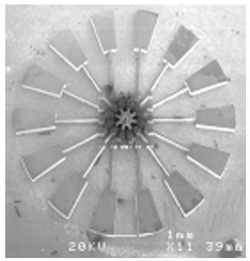
MEMS Sensors & Actuators



Ultra-fast detection relative humidity sensors fabrication using X-ray Lithography.

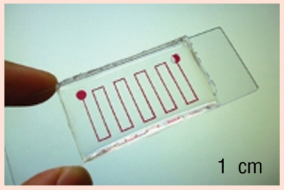


Development of environmental sensors (humidity, ammonia, and a variety of gas sensors on plastic foils).



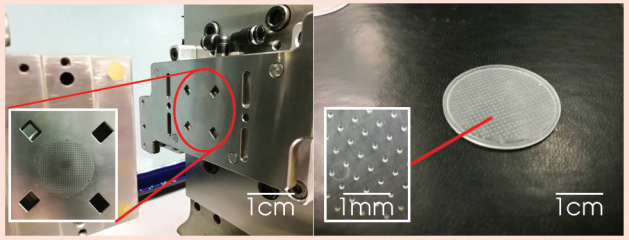
Electrostatic micromotor fabricated using Deep X-ray Lithography and LIGA. The electrostatic force generated by electrical potential causes the rotor moving. It can be used in many applications such as microgear, pumps, hard disk drives, and high accuracy position control devices.

Microfluidic devices



Technology of manipulating and controlling fluids, typically in the range of microliters to picoliters, for chemical synthesis and biological analysis.

Microparts & molds



LIGA-like process is used to fabricate Ni insert in the plastic injection moulding process. It offers a reliable fabrication of high-accuracy microscopic parts with high throughput and cost-effective.

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BL6a: DXL
Deep X-ray Lithography

Synchrotron Light Research Institute (Public Organization)

Technical Specifications

- Technique

  Deep X-ray Lithography (DXL)
- Radiation Source

  Bending magnet
- Photon Energy

  2-10 keV (White beam)
- Beam Size at the Sample

  79 mm (horizontal x 15 mm (vertical)
- Vertical Scanning Length

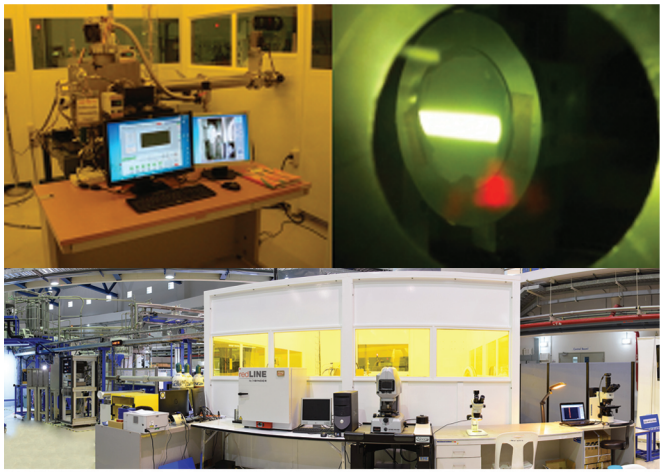
  120 mm
- Scanning Speed (vertical)

  2.87 mm/s
- Aspect ratio

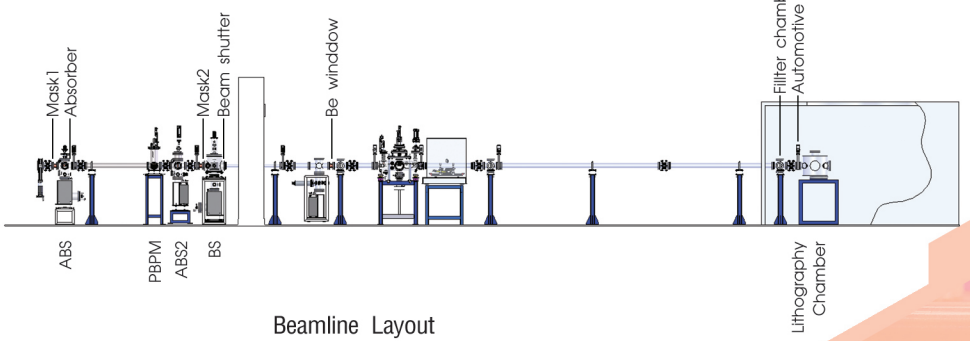
  15

BL6a: Deep X-ray Lithography

BL6a is currently operating in time-sharing mode with BL6b: micro XRF. An X-ray from the bending magnet is transported to the end-station through typical beamline components i.e. absorber, beam shutter and beryllium windows. The facilities provides access to the Deep X-ray Lithography beamline with photon energy ranging from 2-10 keV (white beam), equipped with an in-house developed scanner allowing a fully automatic exposure procedure, a scanning speed of about 3 mm/s, the irradiation of 4 inches substrates, and an exposure area of 15x79 mm. The exposures can be performed under vacuum and/or in helium or nitrogen atmosphere. Specific sample holders can be designed and constructed for particular applications.



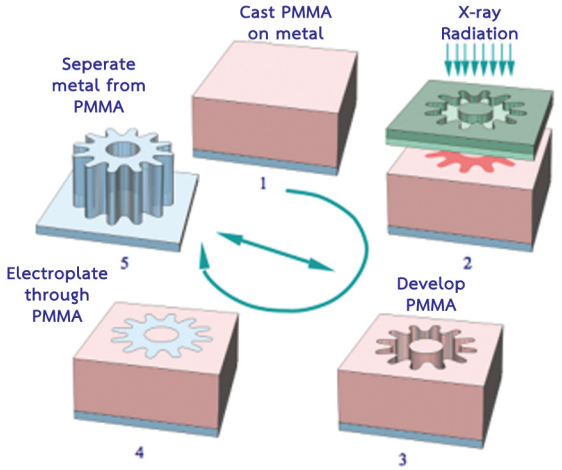
Deep X-ray Lithography (DXL) beamline & end-station



Beamline Layout

Basic principle of X-ray Lithography & LIGA

LIGA is the German acronym for X-ray Lithography (X-ray lithographie), electrodeposition (galvanoformung), and molding (abformtechnik). The process involves a thick layer of photoresist in the range from few microns to millimeters), high energy X-ray radiation exposure and development to arrive at a 3D resist structure. Subsequent electrodeposition fills the resist mold with a metal. After resist removal, a free standing metal structure can be achieved. The metal shape may be the final product or can be served as a mold insert for precision plastic molding[1].



[1]Marc J. Madou, *"Fundamentals of Microfabrication" The Science of Miniaturization*