

Largescale, Rapid 3D Micro/Nano Fabrication Functional 3D Devices (Polymer, Ceramics, Metals)

About this Project

■Multiscale 3D fabrication systems using various kinds of lasers

Efficient direct fabrication of 3D parts (resolution: sub 100 nm - mm)

■Low-cost, high-precision, microscale 3D printer (resolution: 0.5 – 10 μm)

Production of 3D microparts using transparent polymers and ceramic composites

■Open laboratory at Kanagawa Institute of Industrial Science and Technology (KISTEC)

A low-cost, high-precision 3D printer using a blue laser has been installed in Fablab Ebina β

■Multiscale, multidepth 3D microfabrication system using optical fibers

Large-scale 3D fabrication with a wide range of fabrication resolution (1 – 1000 μm)

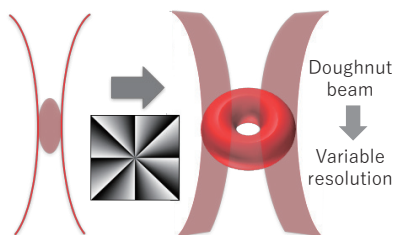
■Two-photon microfabrication system using a doughnut beam

Rapid microfabrication using a variable focus (resolution: 0.2 – 3 μm)

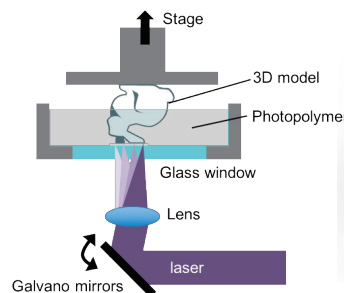
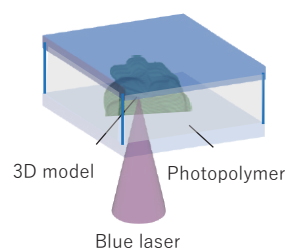
■3D shape reconstruction of 3D printed transparent microparts

Simple 3D shape reconstruction system using UV-LED, camera and rotational table

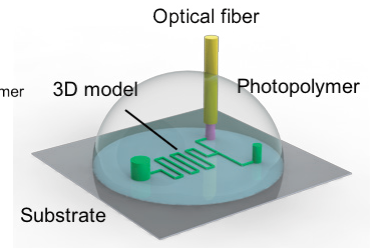
Two-photon lithography



Multiscale 3D printing using a blue laser



Optical fiber lithography



Test Uses / Application Examples

Needs for microscale 3D printing

Resolution: 10 – 100nm (Model size: 1 – 100mm)

Nanoimprinted mold·Meta-lens·Meta-surface·Metamaterial

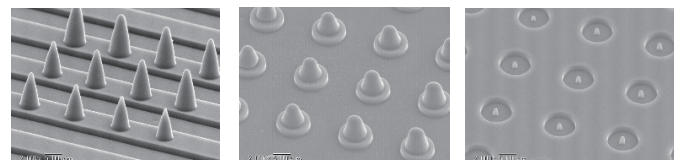
Resolution: 0.5 – 10μm (Model size: 0.1 – 100mm)

Mechanical·Fluidic parts (Nozzles, Filters, Manipulators, etc.)

Electrical parts (Electrodes, Connectors, Ceramic parts, etc.)

Medical parts (Orthodontics, Denture, etc.)

Test use: Additive fabrication on nanoimprinted film

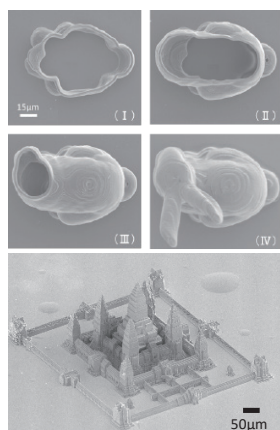


Partner company: Kyodo International Inc.
3D microparts are additively fabricated on nanoimprinted films.

Research Achievements

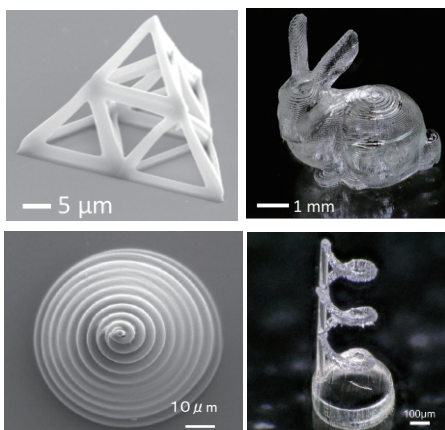
We have developed several types of micro/nano stereolithography techniques (resolution: sub-micrometer to millimeter) such as a two-photon microfabrication system using a doughnut beam, a low-cost, high-precision 3D printer using a blue laser beam, a multiscale 3D fabrication system using multiple optical fibers. 3D micro/nano devices produced by these systems will be applied to various kinds of application fields including medicine, dentistry, electronics, and mechanical parts.

Two-photon lithography

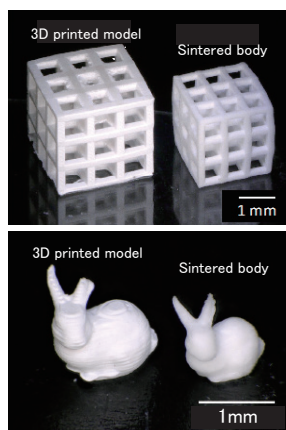


Resolution: 0.1 – 3 μm

Multiscale 3D printing using a blue laser (Polymers and ceramic composite resins)

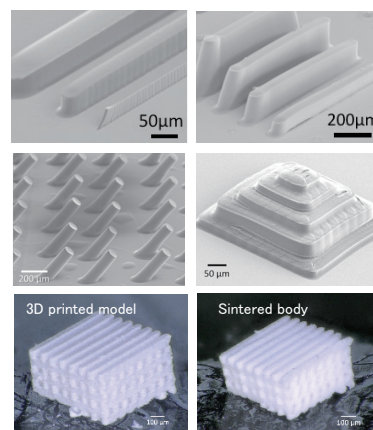


Resolution: 0.5 – 10 μm
(Photopolymer)



Resolution: 10 – 60 μm
(Ceramics)

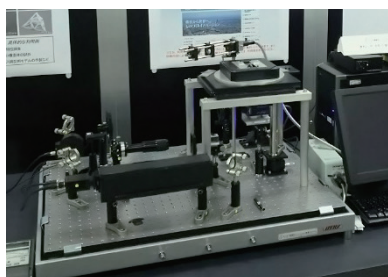
Multiscale, multidepth lithography using optical fibers



Resolution: 1 – 1000 μm

Future Outlook

Multiscale 3D printing systems using various kinds of lasers can provide sophisticated 3D microstructures made from polymers, ceramics and metals. An ultrahigh precision 3D printing system is installed at Fablab Ebina β in Kanagawa Institute of Industrial Science and Technology (KISTEC). This system will be used for open innovation.



Ultrahigh-precision 3D printing system installed in KISTEC for open innovation



Research Theme : Development of super 3D fabrication platform and production of high value-added products

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