

Grayscale Lithography

Creating complex 2.5D structures in thick photoresist by direct laser writing



Dominique Collé - Heidelberg Instruments - EPIC Online Technology meeting on 3D Printing

Heidelberg Instruments

World leader in the production of innovative mask-less aligners & laser lithography systems.

INSTRUMENTS

Principle of Grayscale Photolithography



Afterward, the resist topography can be transfered to a different material: the substrate itself (etching) or a molding material (electroforming, OrmoStamp®).

From an idea to a structured resist

INSTRUMENTS



- Starting with a design (STL, BMP, RAW, DXF,...)
- The Hi-Convert 3D software creates the machine data allowing for <u>arraying</u>, <u>stepping</u>, <u>rotating</u>, <u>merging</u> <u>multiple</u> <u>designs</u>, <u>etc</u>.
- The user places the substrate on the stage, chose a few parameters and start the exposure.
- The machine can find the center of the substrate, align to some existing structures and then the exposure starts.
- Spatial Light Modulator (SLM) : dynamic mask
- Ultra fast light modulation between each pixel.
- Up to 1000 gray levels are accessible for each pixel (minimum pixel size 50nm).
- SLM combined with focusing optic and XY stage motion enables fast writing of high resolution over large areas.
- The design is exposed stripe after stripe.
- <u>The user remove the substrate from the system, develops the resist, and can</u> <u>inspect its surface.</u>



Application Examples





Complex Convex Lenses



Tilted Micro-lenses



Optical Diffuser



Diffractive Optical Element



Fresnel lenses



Decorative printing

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Thank you for your attention!

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