Excimer laser machining of microfeatures for high power laser and beamline experiments

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Introduction

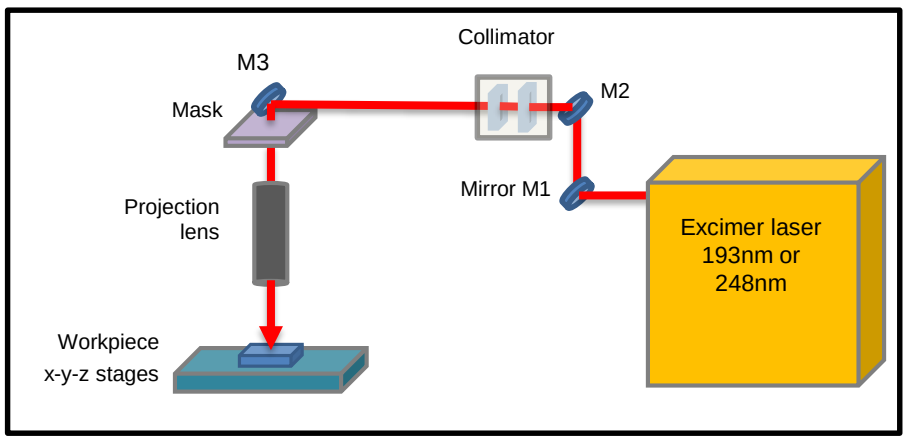
Scitech Precision laser micromachining offers further capability to high power laser experiments with the manufacture of high yield, high precision targets using the UV Excimer laser, operating at 193nm or 248nm. The image of the pattern is projected onto the workpiece allowing multiple target/ target components to be produced per Excimer laser exposure, leading to a reduction in manufacturing time.

Excimer laser machining

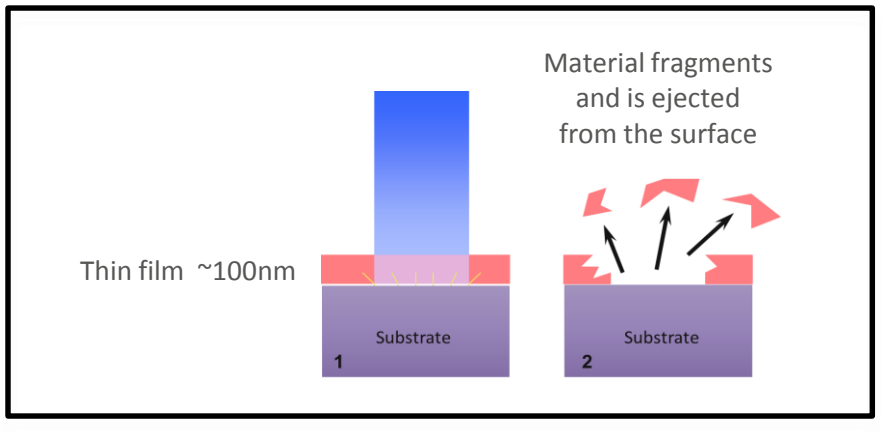
Mask projection system: x1 to x30 demagnification range
Lens N.A from 0.15 (at x10 demag)
allows use of complex mask design

Laser parameters: 193nm or 248nm
60W, 200Hz
17-25ns pulse, 100mJ

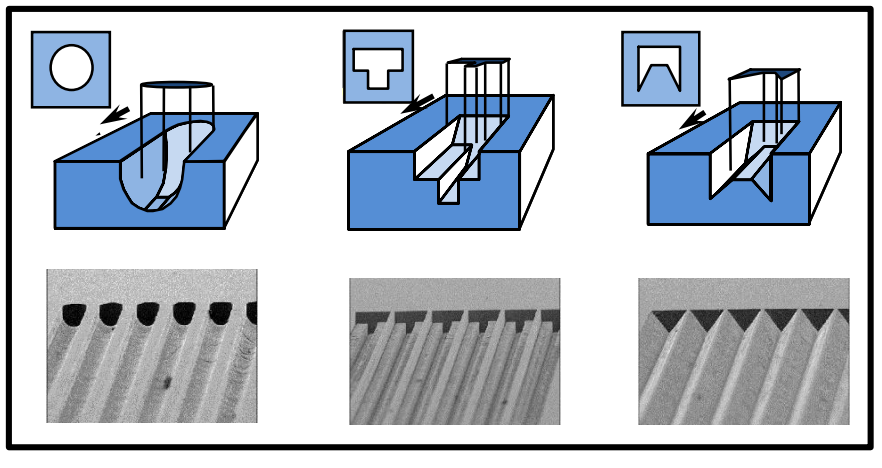
High resolution micron level CNC laser micro machining; ideal for diamond, polymers, ceramics, sapphire, <100nm metal films.



Excimer laser (thin film) interaction:

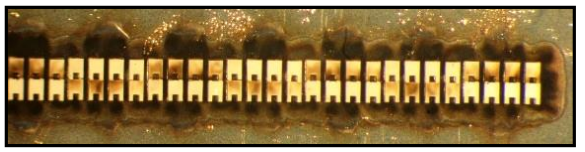


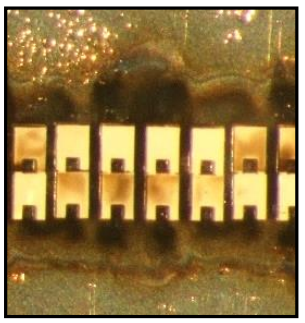
Mask dragging profiles:



Excimer machining of multilayer 50µm cubes

The project involved laser machining cubes from a 50µm multi-layered coating using the 'step & repeat' method of laser machining.
The layered samples (7 variants) comprised parylene with embedded chlorinated layers and flash coatings of aluminium and bismuth.
Scitech Precision would like to acknowledge AWE TF for characterisation support and sample supply.

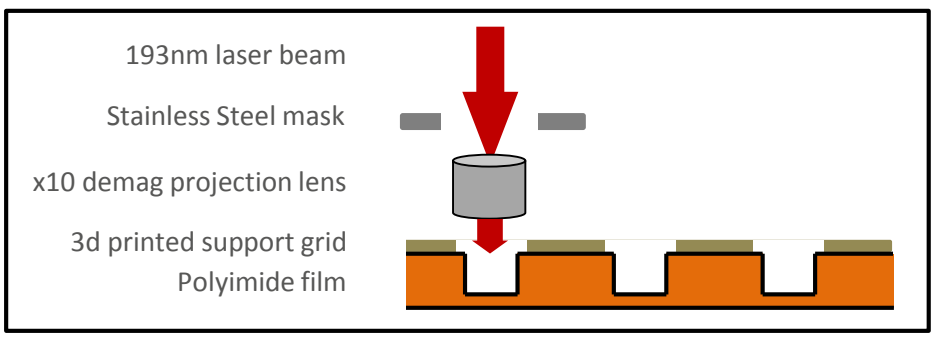




R&D techniques are used to determine the optimal machining parameters: shots per unit area, energy, frequency).

Tape targets

CNC laser micro machining of specified structures and geometries allows the production of 'tape targets'. The Excimer laser was used at 193nm to produce 600 windows per sheet (0.8x0.8mm, 20µm depth) in 25µm polyimide film for Imperial College (refer to Sam Astbury talk, CLF, STFC)



Well Machining

CNC laser micro machining allows flexibility in changes with structure dimensions, pitch and quantity within a simple program. The Excimer laser was used at 193nm to produce variable diameter, depth and pitch 'wells' in 25µm polyimide film for a medical application at Diamond Light Source Ltd.