Microtargets Manufactured by Scitech Precision for High Power Laser Experiments

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Introduction

Scitech Precision delivered over a 100 projects this calendar year using technologies, such as thin film coatings, MEMS manufacturing, low density material production and laser machining. This poster looks at a few of the complex microtargets in more detail, with the main focus being thin film coatings and micro assembly.

Turbulent plasma targets

These complex targets were for an experiment carried out at the LMJ facility in France. The target was used to simulate collision of turbulent plasmas. The target consists of many techniques such as laser machining, micro machining, thin film coatings and micro assembly. The target was assembled to ≈20µm accuracy using additive manufactured jigs.

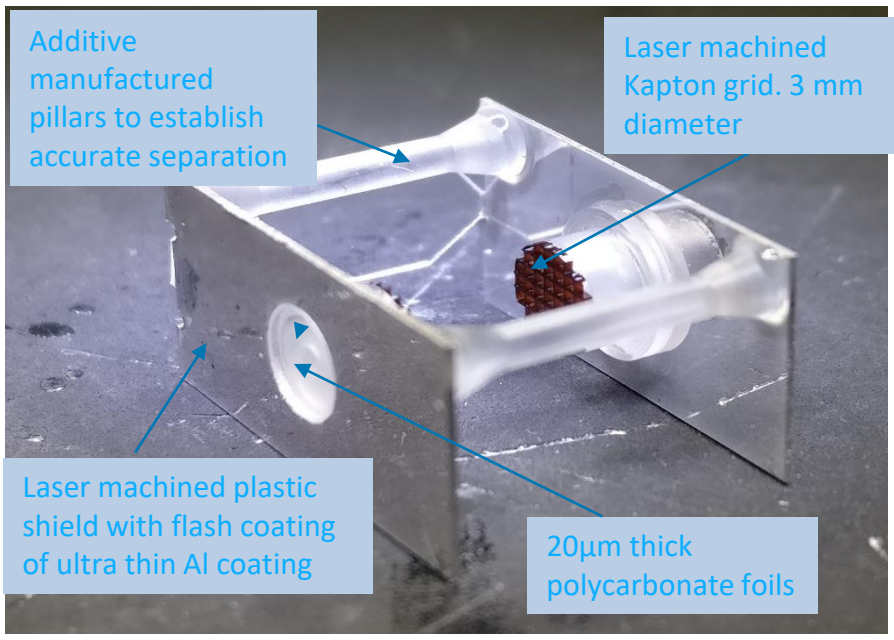
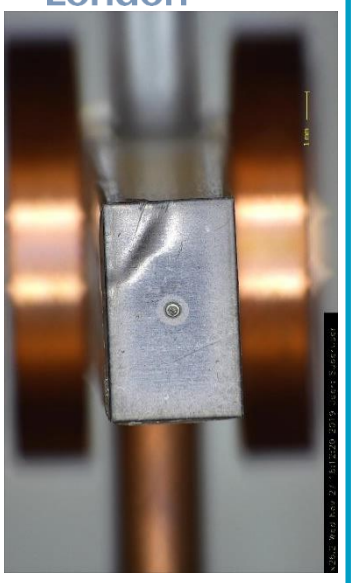


Figure 1: An image of a completed target

Gas cell targets

This complex target which studied the propagation of a plasma in a gas was fabricated for Imperial college. This target required many techniques as it needed to be leak tight.

The target consists of a micro machined block with Kapton windows for diagnostics. On single shock targets, there is a brominated plastic pusher with a polypropylene ablator. For double shock experiments, there was a 10um plastic coating with a gold thin film coating. Copper shields are present to protect the diagnostics from xrays produced by the laser interaction. A 20um thick iron or scandium disc is used as a xray backlighter. The whole target is leak checked before delivery.



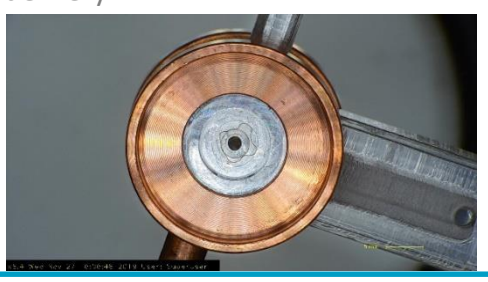


Figure 2: image showing the Cu shield, polypropylene and the ChBr disc from one side. On the right is the the backlighter. The 3D pinhole tube defines the xray backlighter distance. The Cu tube from the bottom is used to fill the chamber with gas to a pressure of 1bar. Figure 3 above shows the backlighter target.

Sine wave targets

This target is designed to study the Rayleigh-taylor instabilities seeded by a sine wave patterend CHBr sample. The CHBr sample is produced by hot pressing on to a diamond turned mould. The low density foam is fabricated in a kapton tube with dimensions of 1.5mmx1mm. There is a 10µm plastic ablator on top of the target which has a flash Al coating.

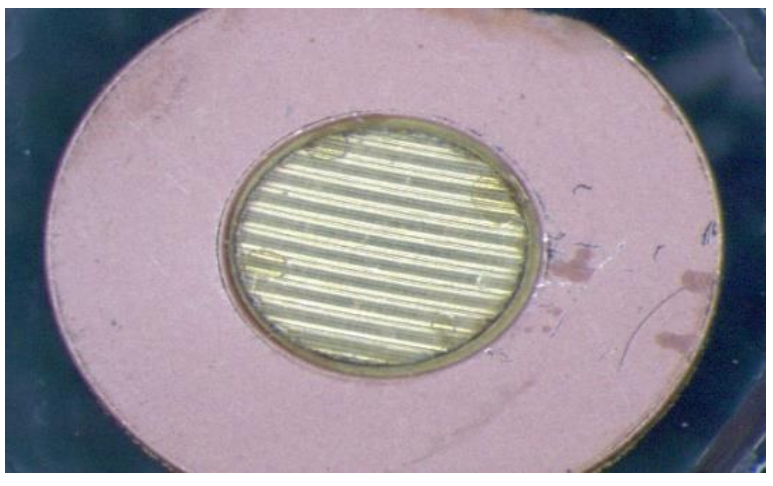


Figure 3: Bright field optical image of a sinewave CHBr disc attached to the plastic abalator with Au and Al coatings. The low density foam will be attached on top to create a contact between the CHBr and the foam.

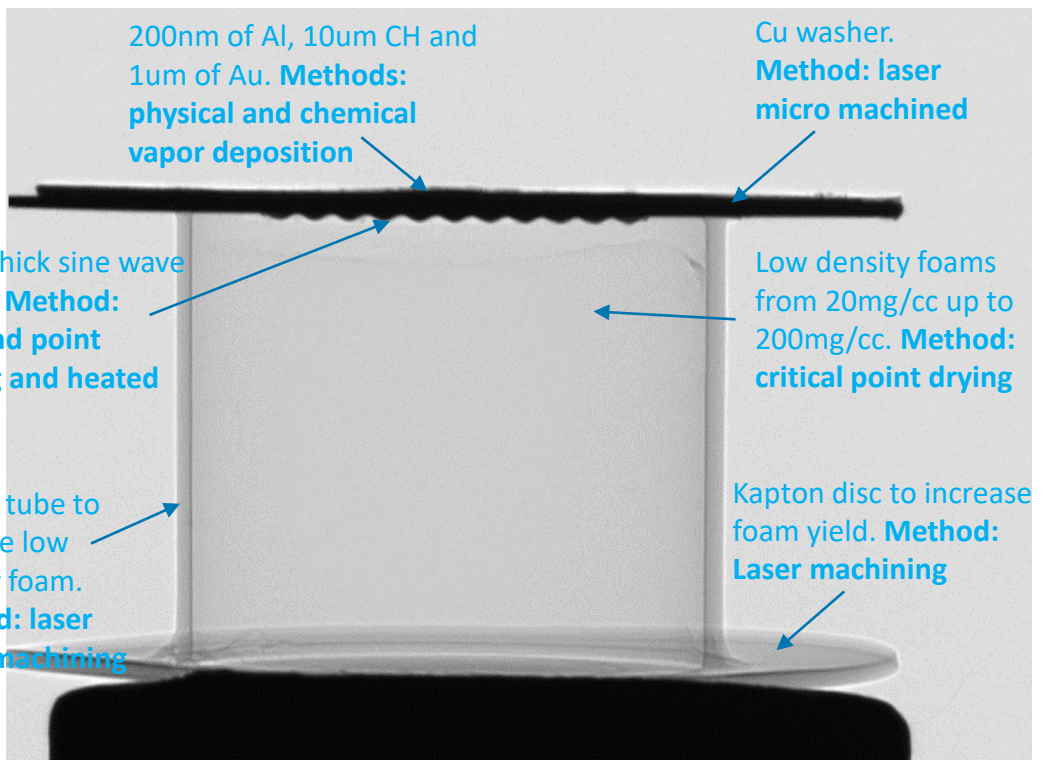


Figure 4: computed tomographic image of a complete target