EPSRC Centre for innovative manufacturing in ultra precision

CDT-UP Newsletter

Centre for Doctoral Training in Ultra Precision Engineering

March 2015

PhD Project Request

If you would like to offer a 3 year PhD project, under the Ultra Precision topic, to one of our current MRes students please email Sophie Fuller, sg523@cam.ac.uk, with the details of this. The students begin their PhD projects in October after successful completion of the MRes. The CDT in Ultra Precision will fund their student fees, EPSRC minimum maintenance and some travel costs, but we ask that you source funds from industry for an additional top-up for the student, and to cover project consumables.

October 2015 Recruitment

To apply to join the 2015 MRes in Ultra Precision cohort please email your CV to cdtup-enquiries@eng.cam.ac.uk. This course offers full funding to UK students. The closing deadline is the 30th June 2015.

Congratulations to Mr and Mrs Ten

PhD Student Jason Ten of the Centre for Industrial Photonics married his now wife Sally Yu during two ceremonies over Christmas. One took place in Wuxi, China on the 28th of December and the other in Kuantan, Malaysia on the 2nd of January. We wish you all the best for the future!

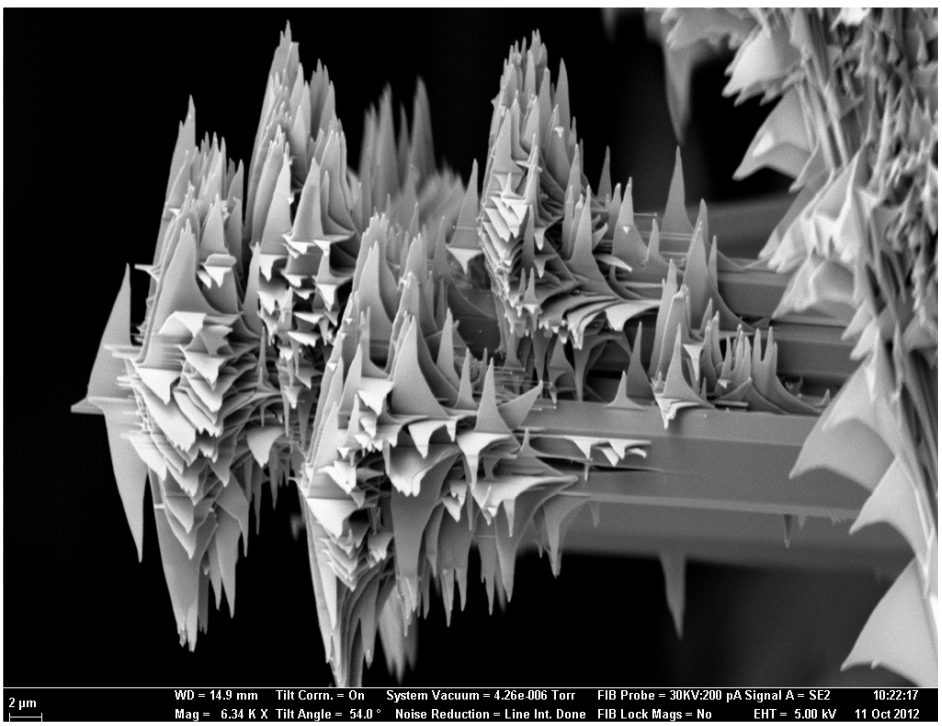
Ultra Precision Manufacturing Conference 2015

The EPSRC Centre for Doctoral Training in Ultra Precision is holding a one day conference and exhibition on the 12th May 2015, at the Institute for Manufacturing in Cambridge. This will showcase the best advances in ultra precision engineering in fields such as nano- & micro-manufacturing, metrology, mechatronic systems & control, and ultra precision machines. The event is designed to provide an opportunity for industrialists and academic researchers to share their latest ideas and to explore future collaborative opportunities in the field of Ultra Precision engineering.

Topics will include:

- Precision Mechatronic Systems and Control
- Precision Machining Processes
- Metrology
- Additive Manufacturing for Precision Engineering
- Novel Advances in Precision Engineering & Nanotechnologies
- Ultra Precision Devices

Registration is free, but places are limited.
Please contact up.conference.2015@my-ifm.net to register.



UNIVERSITY OF CAMBRIDGE

Cranfield UNIVERSITY

EPSRC Pioneering research and skills

Project Feature: High Speed Mask-less Laser Controlled Precision Additive Manufacture

Introduction

In the nanoscale, there is the focused ion beam (FIB) deposition (Figure 1) while in the micron scale there is inkjet printing. These additive methods are used in research and development of advanced functional materials such as graphene and carbon nanotubes (CNTs) to manufacture next generation functional devices.

Research motivation

Is it possible to deposit materials with lasers at a high deposition rate with high precision? Is it possible to develop an integrated one-stop laser manufacture platform for advanced functional devices?

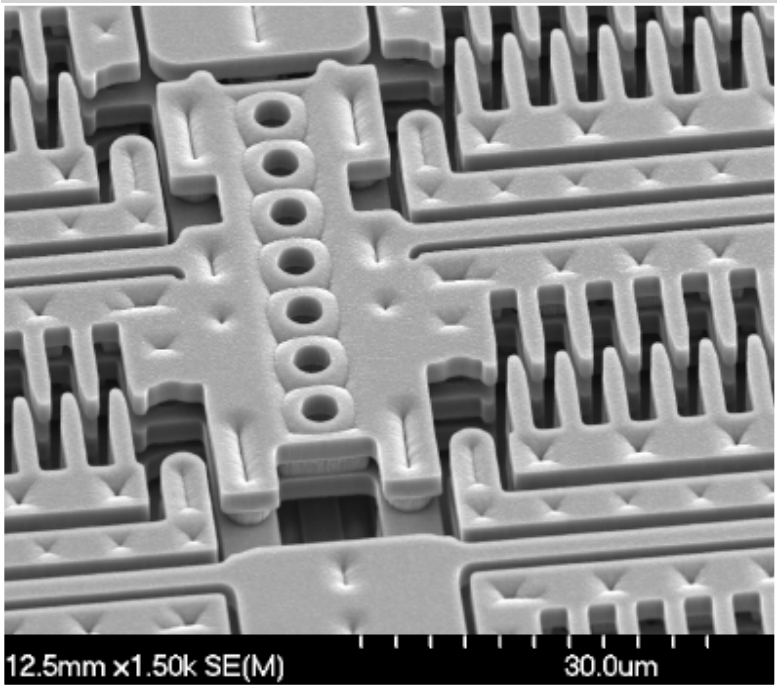


Figure 2: An application example of the high speed mask-less laser controlled deposition technique: MEMs devices.

Capabilities target

The target capability of this project is to deposit various functional materials including metals, semiconductors, insulators and advanced functional materials such as graphene and CNTs at a deposition rate of 10 – 1000 µm3/s at locations controlled by a laser. This will be done a target accuracy of sub-micron with a repeatability over 100 mm range. The application areas include the fabrication of transistors, sensors, micro electromechanical systems (Figure 2), and photo voltaic cells.

Deposition mechanism

Two deposition mechanisms will be explored: thermal and photolytic. The thermal deposition is akin to chemical vapour deposition however the laser will be used as a local heat source. The advantage of the thermal deposition is that the deposition is usually uniform however high temperatures may be required for high purity deposition. The second mechanism, photolytic deposition, relies on a UV laser to break down the precursor. The advantage of this method is there should be negligible thermal damage to the substrate however coverage may not be uniform and adhesion quality may be poor.

Conclusion

This project will focus on laser deposition of various materials at precise locations controlled by a laser. This capability will complement other techniques explored in the Centre of Innovative Manufacturing in Ultra Precision to create a holistic manufacture platform for next generation functional devices.

Jason Ten, jst44@cam.ac.uk

Figure 1: FIB deposition results which have good resolution and material range but low deposition rate.

Save the Date:

Ultra Precision Manufacturing Conference, 12 May 2015, IfM

Manufacturing the Future Conference, 17 & 18 September 2015, Cambridge