University College Dublin
Ireland's Global University

CENTRE OF MICRO/NANO MANUFACTURING TECHNOLOGY

(MNMT-Dublin)

PROTOTYPING AND PRODUCTION OF PLASTIC MICROFLUIDICS

Cyclic Olefin Copolymer (COC) microfluidic chip

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Welcome to the UCD Group for Polymer Micro/Nano Manufacturing Technology

Our group is an integral part of the UCD Centre of Micro/Nano Manufacturing Technology (MNMT-Dublin) led by Dr. Nan Zhang, a Lecturer/Assistant Professor in *Manufacturing and Design* in UCD.

Our research is focused on the design, development, and manufacturing of small and precision plastic components and polymer-based functional devices, such as **microfluidics**, **medical devices, functional surfaces** and **freeform optics.** These are critical components and products in the fields of life sciences, electronics, medical, photonics, automotive, and aerospace.

Our Research and Service

Manufacturing of of microfluidic devices, medical devices, functional surfaces and freeform optics favours the use of thermoplastic materials, since these are synonymous with mass production technologies, such as microinjection moulding. Our laboratory designs aim to span the bridge

from small to large scale production by focusing on design and manufacturing related challenges, such as design feasibility evaluation, mould design and construction, micro tool/insert manufacturing, replication process development, assembly/ bonding process development, and quality monitoring and control.

Our existing technologies and process know-how include:

- ***Design and prototyping of plastic microfluidics***
  - Design and feasibility evaluation of plastic microfluidic chip
  - Material selection
  - Prototyping processes design and development
  - Development of prototypes using existing polymeric microfluidic chip platforms
- ***Manufacturing of microstructured tool inserts***
  - Ultra-precision machining
  - Micro/nano electroforming
  - Bulk Metallic Glass (BMG) multi-scale tools
- ***Small quantity production and validation***
  - Mould design and construction
  - Microinjection moulding (with variotherm and vacuum venting)
  - Micro hot embossing/nano-imprinting
- ***Bonding of plastic chips***
  - UV assisted thermal bonding
  - Vapour assisted thermal bonding
- ***Quality assessment***
  - VHX 5000 digital microscope
  - Broker 3D Surface measurement equipment
  - Moulding process monitoring and control

Collaboration

We welcome all collaborative opportunities including preliminary studies, contract R&D, manufacturing and consultancy service, collaboration grant application, innovation partnership, etc.

Lead PIs

Dr. Nan Zhang: Lecturer/Assistant Professor, Group Leader

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Prof. Fengzhou Fang: Director of The Centre of Micro/ Nano Manufacturing Technology (MNMT-Dublin)

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Prof. Michael Gilchrist: Professor at School of Mechanical and Materials Engineering

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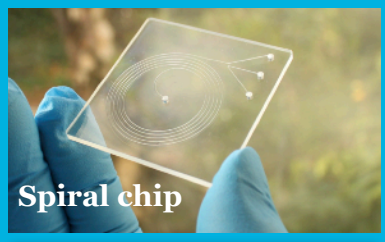
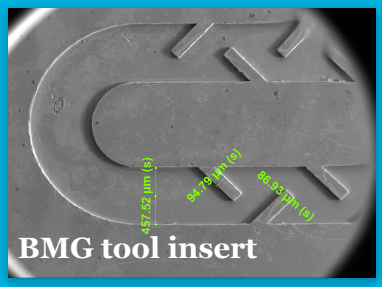
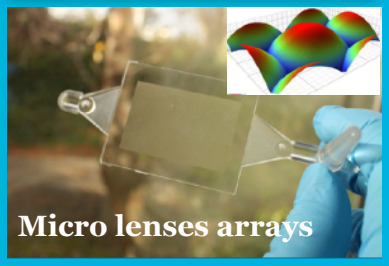
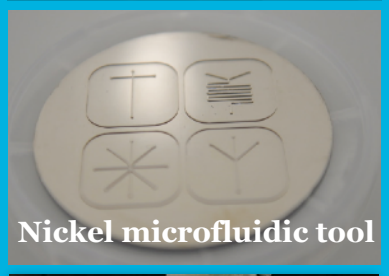
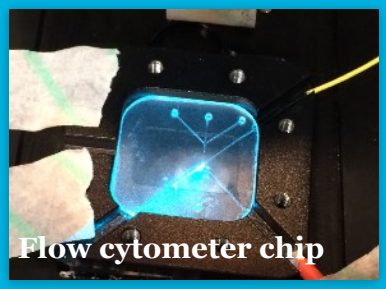
Nickel tool insert


Spiral chip


BMG tool insert


Micro lenses arrays


Nickel microfluidic tool


Flow cytometer chip

BMG nanostructure