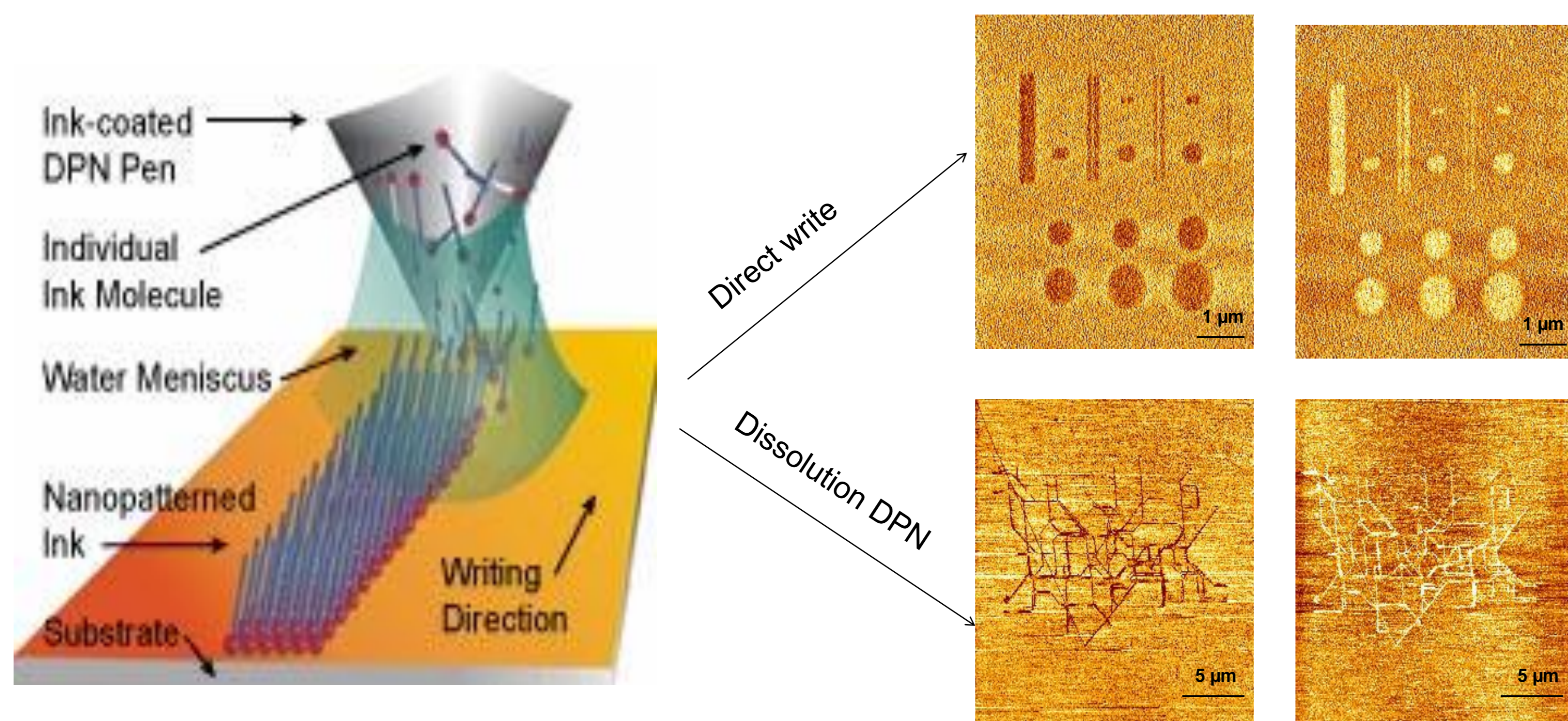


Dip pen nanolithography (DPN)

Dip Pen Nanolithography is a scanning probe lithography where an AFM tip is used to transfer molecules to a surface via a solvent meniscus. This technique allows surface patterning on scales of > 100 nanometers.

Though well established for thiol-gold based chemistries, we have demonstrated the use of this technique for nanotemplates.



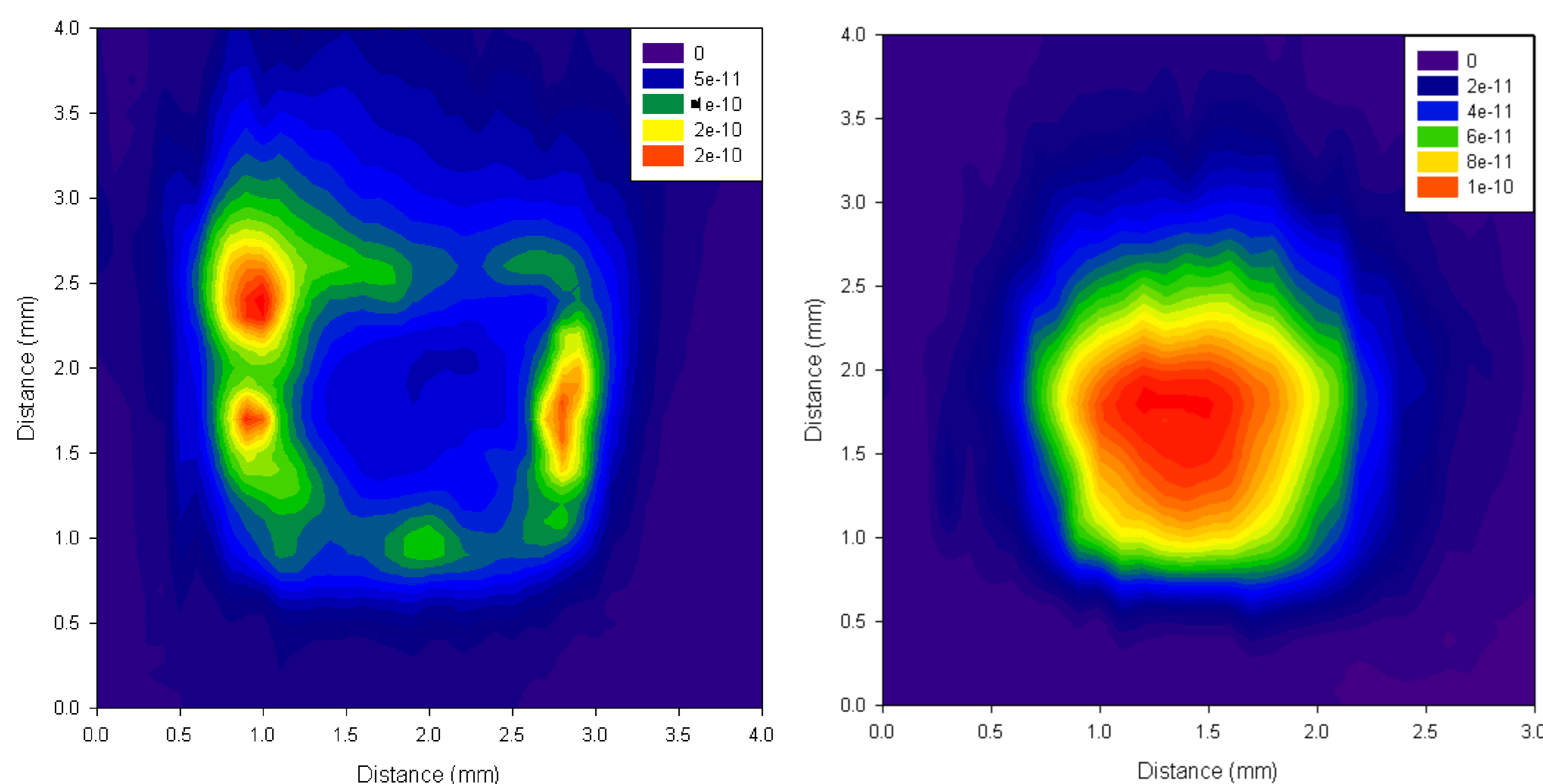
Schematic of DPN technique

LFM images showing (a & b) directly written thiols on gold and (c & d) nanotemplates obtained by dissolution DPN (Reference 1 in publications)

Scanning Electrochemical Microscopy

Scanning Electrochemical Microscopy (SECM) is a scanning probe technique that involves precisely positioning a ultramicroelectrode (UME) at a close proximity to the sample surface and measuring the faradaic currents while scanning the substrate immersed in an electrolyte solution. The measured current depends on the distance between the tip and the substrate, the characteristics of the UME, the conductivity of the sample and provides useful information about the electrochemical activity at nanometre to micrometer scale resolution. In the example presented below the SECM images show spatially resolved glucose diffusion through different polymer membranes by measuring the resultant formation of H_2O_2 . The results could account for differences in membrane performance in glucose sensors.

PERMEABILITY STUDIES OF MEMBRANES USING SECM



SECM images of H_2O_2 diffusion through epoxy-PU (left) and hydrogel (right) membranes coated on GOD immobilised on BSA by GA crosslinking, assembled on polyvinyl alcohol sheets. (Reference 3 in Publications)

Acknowledgements

- Technology Strategy Board (TSB)
- Esmee Foundation
- Biomedical Research Committee (BRC)

Laser Ablation

The laser ablation tool can be used for laser micromachining, micro drilling, laser drilling, micro holes, laser cutting, precision machining, fine cutting, micro fabrication, photonics, MEMS, scribing, etching, laser marking, laser engraving and micro milling.

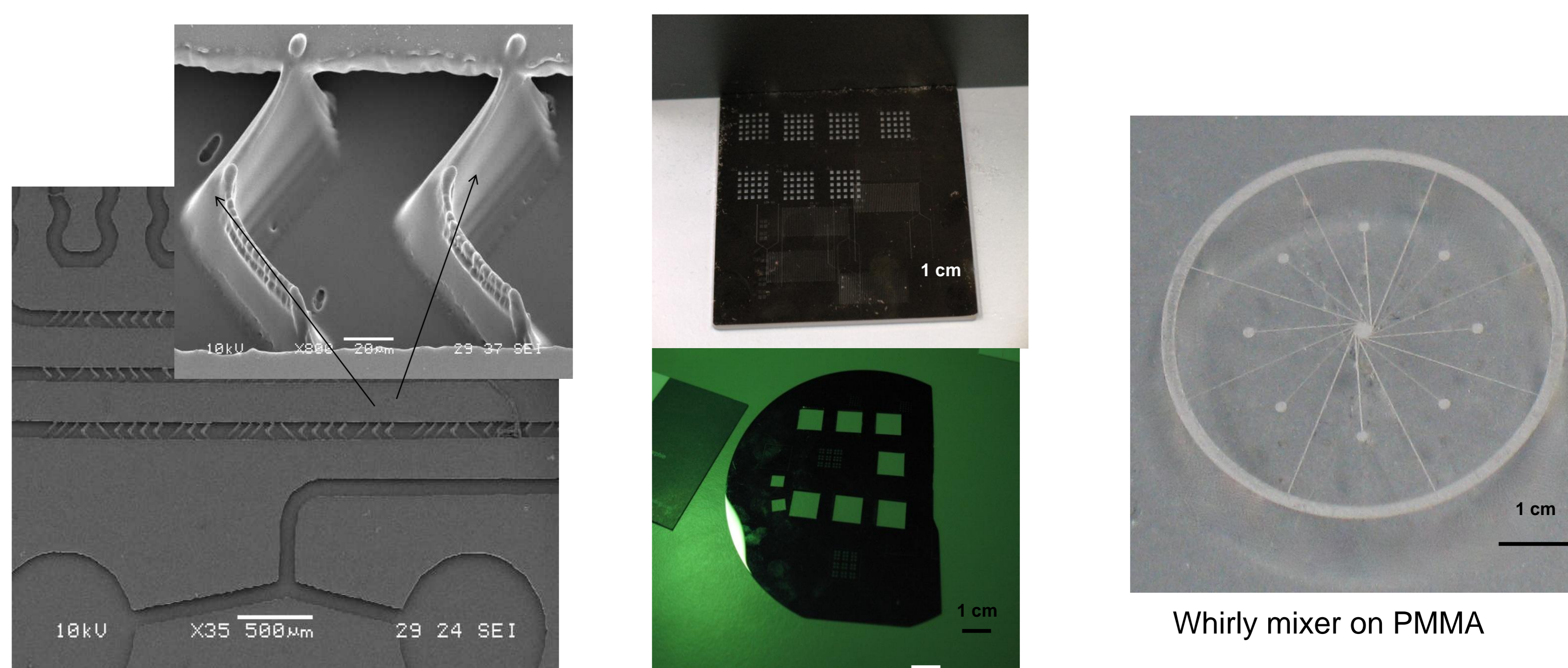
The laser ablation tool can be used for machining many different substrates:

Polymers : PMMA, Polystyrene, TOPAS, PDMS, SU8, PEEK, Teflon

Thin Layers : Cr / glass, ITO / glass, Cu / FR4, ITO / flexible substrates sputtered metal layers, Teflon coatings

Inorganic Solids : Glass, silicon, ceramics, FR4, Quartz

Metals : Aluminium, Copper, Steel, Titanium



PDMS mixer microfluidic chip with chevrons

Cr on glass and diced silicon

Whirly mixer on PMMA

Key Publications

1. Maskless naotemplating using Dip pen nanolithography (DPN), Sanjiv Sharma, Kostis Michelakis & Tony Cass. *Patent application number* 1108134.6, filed 16/05/2011.
2. An integrated silicon sensor with microfluidic chip for monitoring potassium and pH. Sanjiv Sharma, Anna Radomska, Iasonas Triantis, et al, *Microfluidics Nanofluidics* (2011) 10:1119-1125
3. Hydrogel membrane improves batch to batch reproducibility of an enzymatic glucose biosensor. Jakub Trzebinski, Anna Radomska – Botelho Moniz, Sanjiv Sharma, Krishna Burugapalli, Francis Moussy, Anthony E.G. Cass. *Electroanalysis* (2011). (In Press)

LCN team

Academic in charge: Professor Tony Cass

Research Officer: Dr Sanjiv Sharma

Researchers : Dr Kostis Michelakis

Steven Scott

Jakub Trzebinski

Department of Chemistry & Institute of Biomedical Engineering

L6, Flowers Building, South Kensington Campus

Imperial College, London SW7 2AZ

Email: t.cass@imperial.ac.uk; s.sharma@imperial.ac.uk

Phone: 0207 594 5195/1843