

## UKFN Short Research Visit Report

### Integrating tapered micro/nano single mode – multi mode – single mode (SMS) optical fibre interferometer with microfluidics for biosensing applications

Dr Qiang Wu, Northumbria University, visiting Prof Nicole Pamme (NP) & Dr Alex Iles (AI), Chemistry group, University of Hull

The aim of the visit was to develop a high-sensitivity biosensing platform by combining micro/nano SMS sensors developed by my group with state-of-the-art biomicrofluidic devices developed by NP.

With the support of the fund, I visited NP's laboratory in the School of Mathematics and Physical Sciences (Chemistry group), University of Hull. NP's postdoctoral researcher, Dr Ngamsom, demonstrated their unique IFAST system used for bacteria detection, which integrated microfluidic channel, target sample capturing, filtering, concentration, separation and detection into a single system. PhD students Martin G Christensen, Pablo Rodriguez Mateos and Nasr Alamrani demonstrated their experimental setup of electrode flow cells, software for microfluidic design, acoustophoresis, inertial microfluidic systems and optical sensor platform.

I discussed with NP and AI the design and fabrication of microfluidic devices with integrated micro/nano SMS sensors with functionalised fibre surfaces for pathogen capture for sensitive readout following on-chip pre-concentration of the pathogens. We achieved very fruitful results and several designs were developed and the microfluidic channels fabricated by AI, as shown in Figure 1, with different channel profiles (with and without buffer air hole) for preventing contact between analytes and packaging glue.

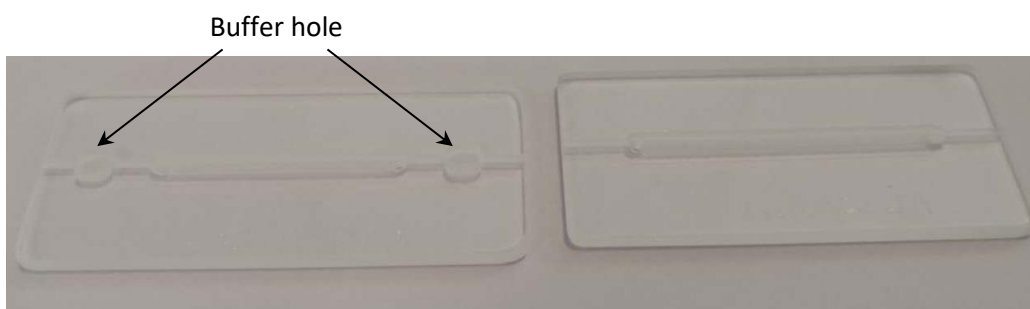


Figure 1: Samples fabricated by Dr Alex Iles with (left) and without (right) buffer air hole design.

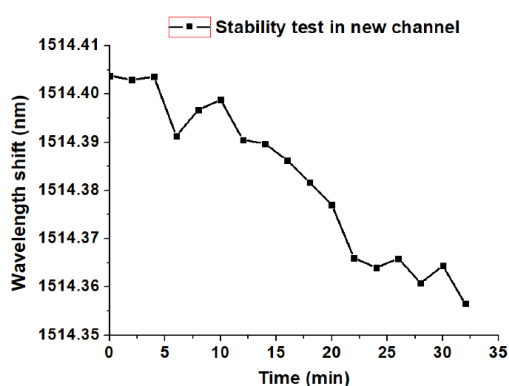


Figure 2: Stability test by immersing micro/nano SMS sensor into the microfluidic channel with phosphate-buffered saline.

Stability testing was carried out, as shown in Figure 2, where only 0.05 nm wavelength shift was observed over 30 minutes, significantly smaller than our previous results (>0.5 nm) without the profile design.

I also discussed with NP and AI the possibility of a joint application for an RCUK grant bid. We have generated ideas for a proposal and a draft has been written with the intention to submit it in two months.