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Cyclops Update

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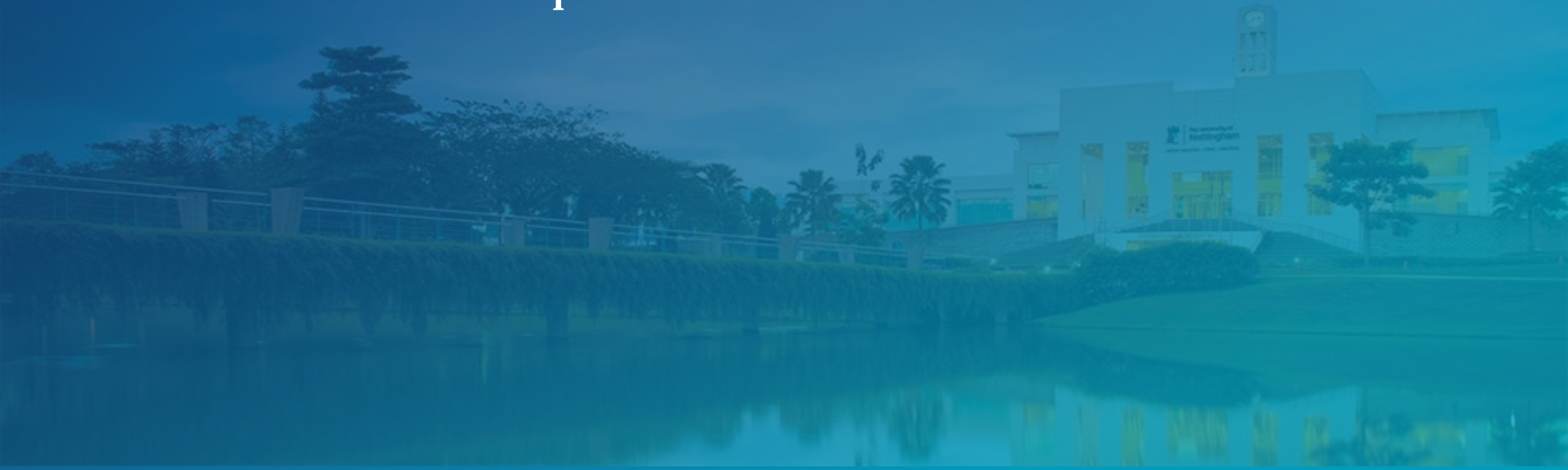
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Closed loop drug monitoring and delivery in intensive care

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- Context
- Scope of work
- Progress
- Future direction/impact

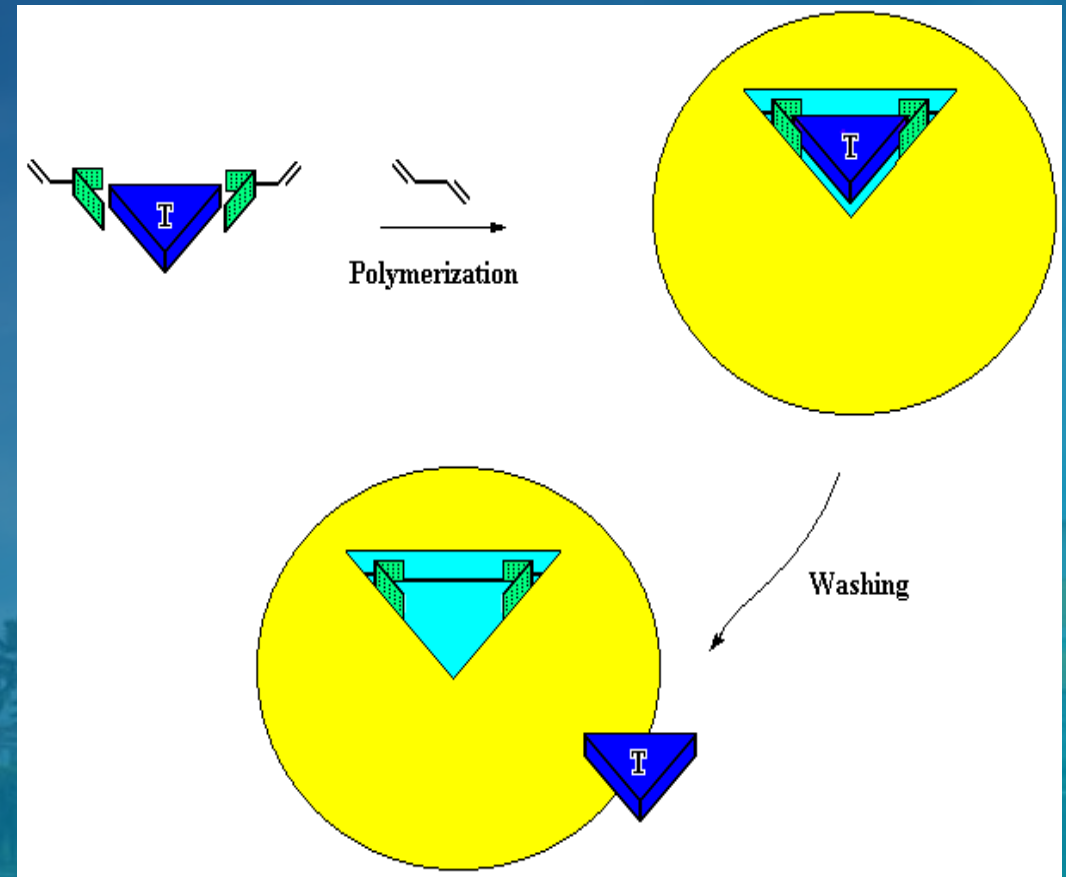




- Drug assay generally not commonly used outside of toxicology
- Some drugs and some disease states it **is** used and has potential in critical care and anaesthesia
 - Relatively narrow therapeutic window
 - Drug distribution and handling (pharmacokinetics) as well as effects (pharmacodynamics) are unpredictable in critically ill
 - Even when assays ARE used, very unusual to perform any kind of in-vivo real time monitoring...inhalation anaesthesia using vapours [volatile anaesthetic agents] being an exception.
- Personalization, closed loop potential, safety (error trapping)
- Identified fentanyl, Propofol and midazolam for investigation



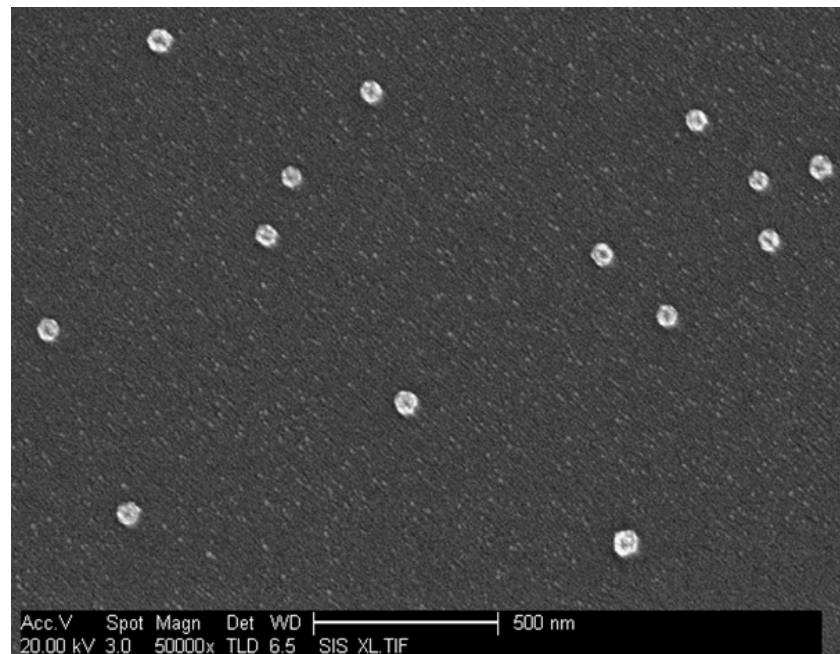
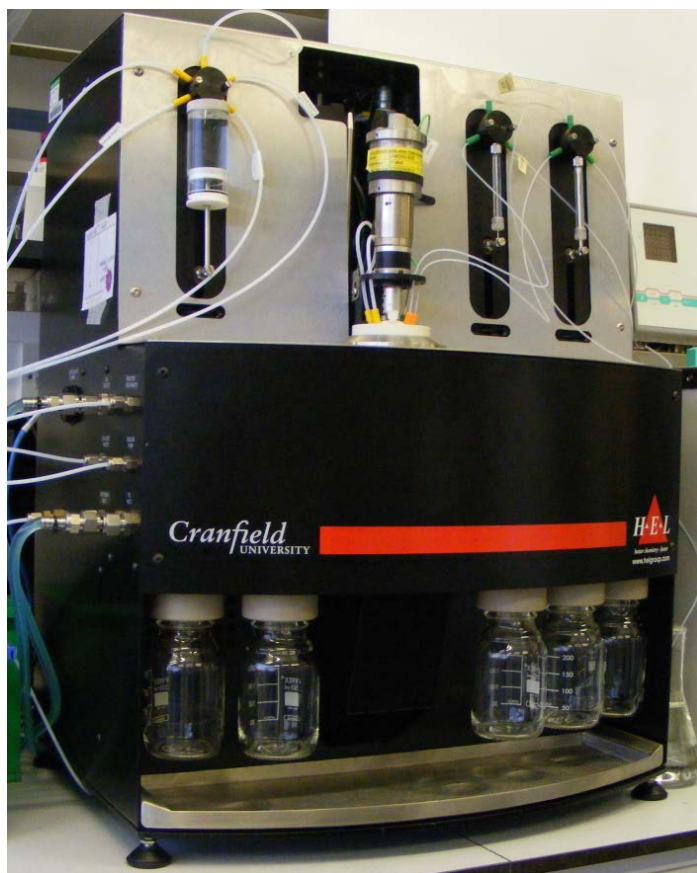
- Creation of synthetic chemical sensor (MIPs) combined with functionalization of fibres
- OFS attractiveness
 - “Multiplexing” of sensor and interrogator
 - Scale – options for manufacture
 - Biocompatibility
 - Safety





Synthesiser for MIP nanoparticles

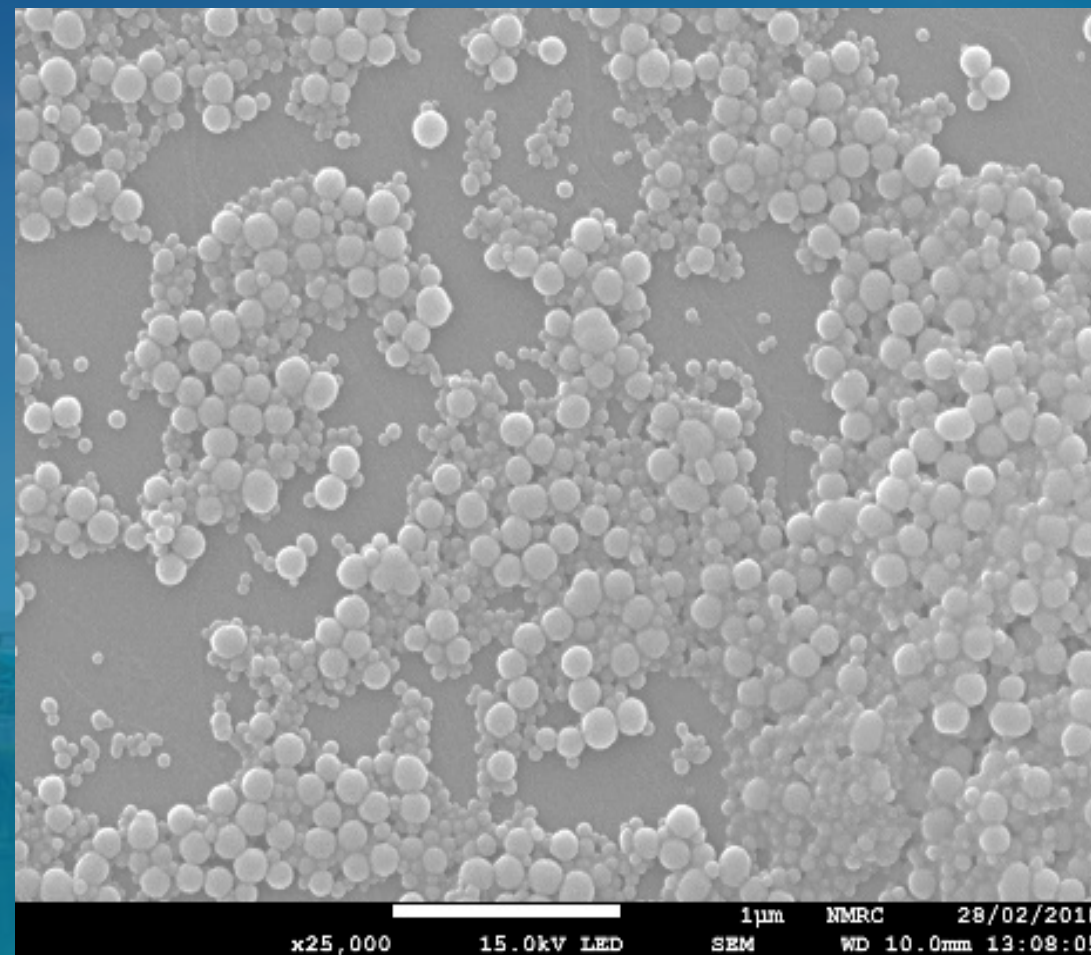
Automatic reactor for
MIP nanoparticles



- Manufacturing cycle – 3.5 hours
- Re-usable template
- Yield – research quantities (up to 10 g/month) (can be scaled up)

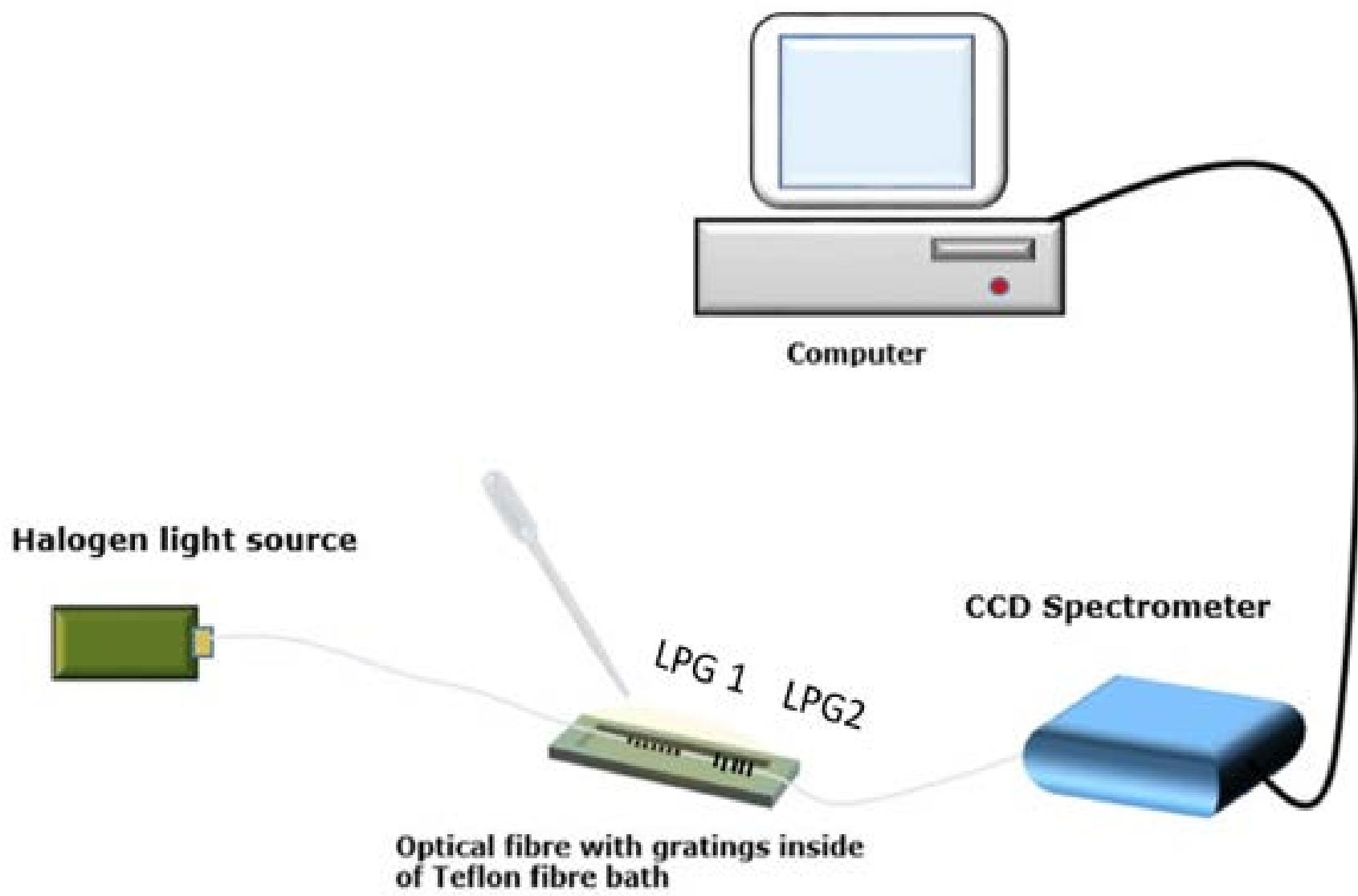


- Generation of chemical templates (MIPs etc)
- Creation of “layers”
- Coating of fibres
- Testing





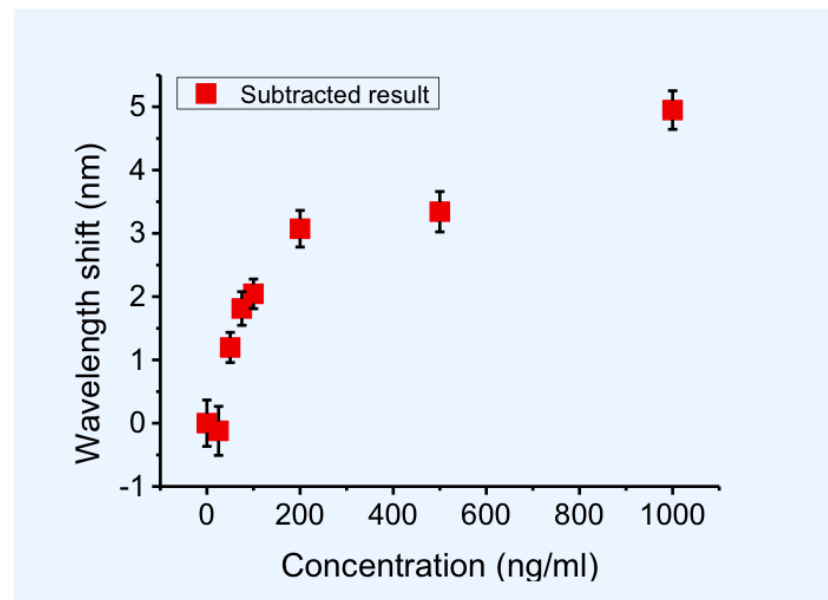
Set up





Templates developed for fentanyl and Propofol. Midazolam proved difficult to find a suitable binding agent.

The LPG sensor coated with the MIP nanoparticles shows an increase of wavelength separation as a result of fentanyl binding with concentrations from 0 to 1000 ng/ml



(d)

Fig 9.7 (a) The transmission spectrum of the cascaded LPGs in different concentration of fentanyl solution range from 1 to 1000 ng/ml. (b) The wavelength of the LPGs responses dynamically to the concentration of fentanyl. (c) The wavelength shift of the detection LPG in contrast to the reference LPG as a function of the concentration of fentanyl. (d) The



Reversibility

In vivo/plasma challenges

Case of need/impact

Manufacturing
considerations

IP

Questions?

