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Functional Polymer Systems

innovative opportunities for novel materials

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Challenges

- Implement new materials to create high value products
- Scale-up of pattern transfer techniques for large volume manufacture with high fidelity
- Embedded devices that high density functionality



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Objective

Development and integration of technologies for the innovation of a mobile D-dimer medical device

To improve the diagnosis of deep vein thrombosis and pulmonary embolism at the point-of-first-contact



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Key device features

- Measure D-dimer concentration in whole blood
 - Immunoassay using high affinity antigen-antibody binding
 - Impedance based detection
 - Microfluidics for sample processing
- Quantitative, accurate and reproducible
- Simple and easy to use
- Mobile with wireless connection to healthcare systems



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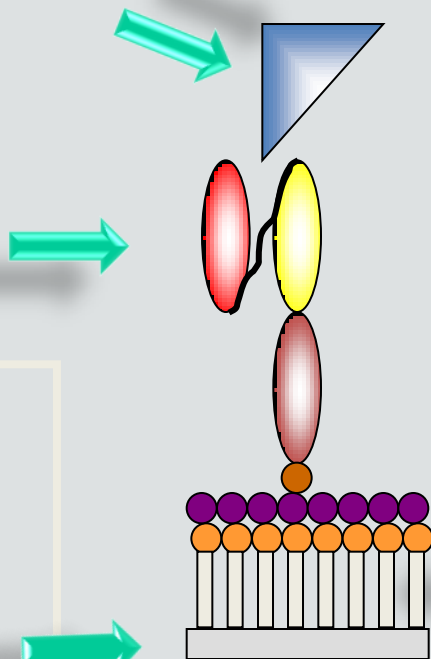
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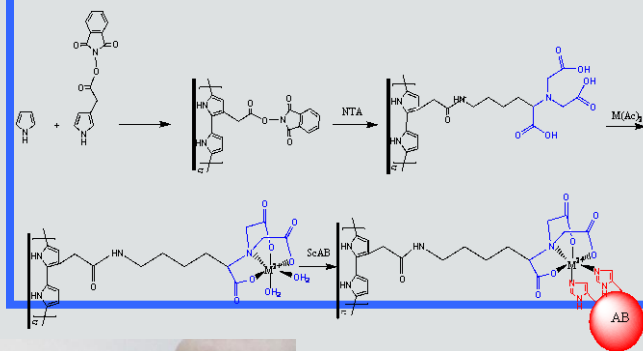
“model” recombinant antibody fragment with His tagged and appropriate antigen



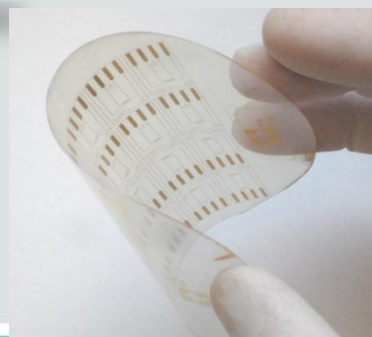
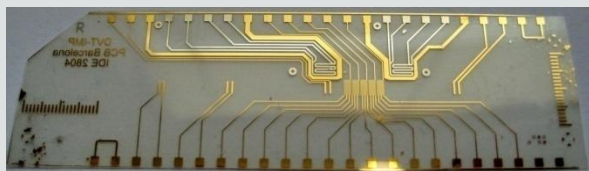
Impedance measurements
Dynamic range of detection of the antigen



- Conducting polypyrrole with redox probe NTA/Cu
- Immobilisation of Tag antibody on a NTA/Cu as linker



IDE microelectrodes
Chips electrodes





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- Microfluidic cartridge for D-dimer assay

- fabrication quality of electrode layer: dimensional accuracy, metal adhesion, fabrication efficiency
- fabrication quality of microfluidic body: fine feature replication
- Improved assembly quality: accuracy, passivation, septum
- Compatibility with mass production: micro-injection moulded microfluidic body, roll-to-roll fabrication of electrode layers



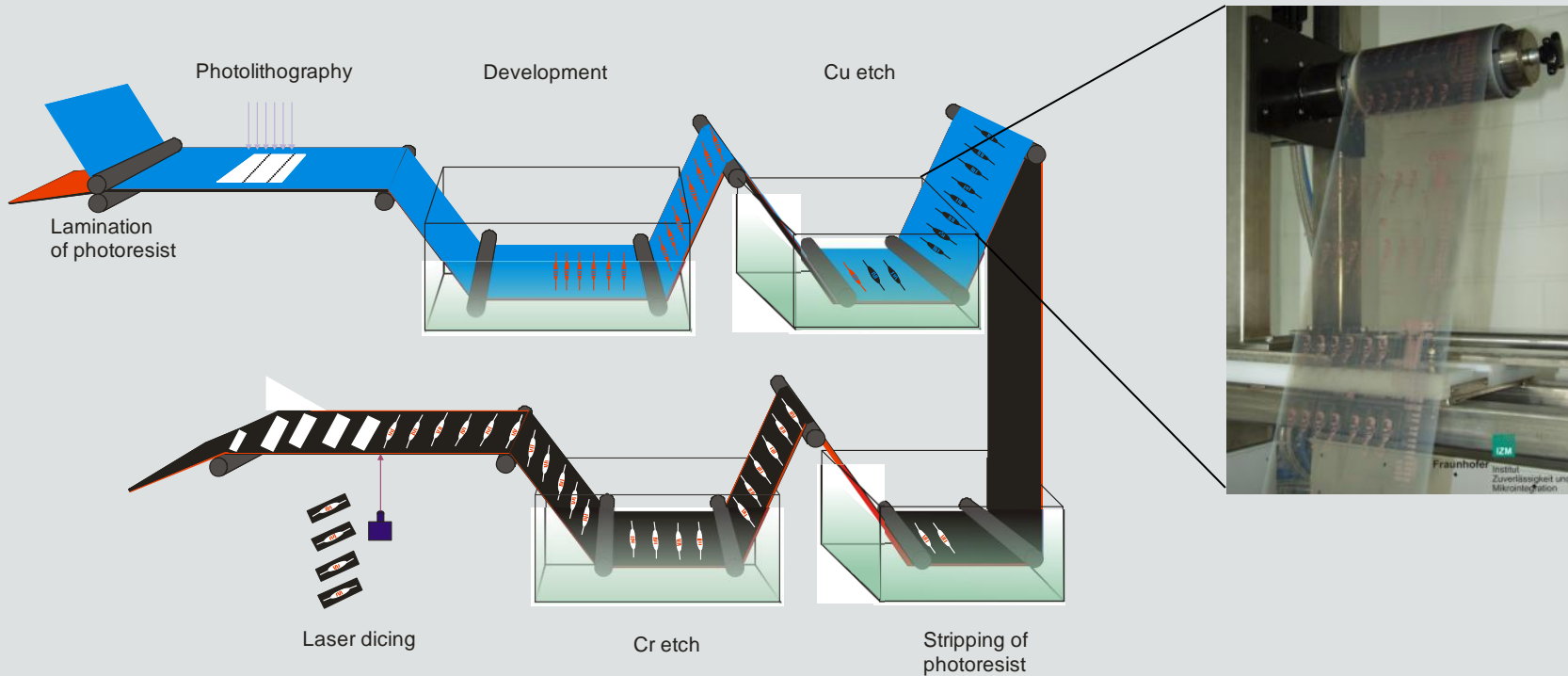


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- Completely foil based microsystems



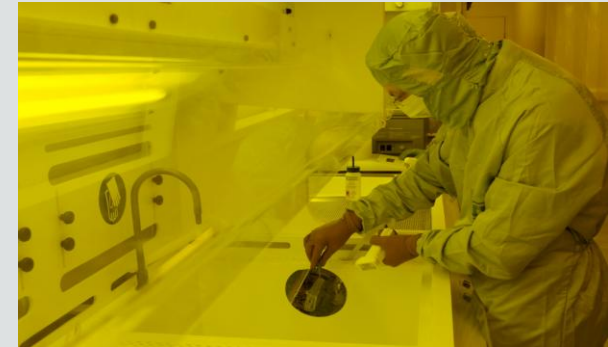


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- Multi-disciplinary team to prototype nano-microsystems
- 140m² of Class 1000 clean room, with Class 100 area with facility for:
 - Photolithography
 - Wet and dry etching
 - Sputtering and thermal evaporation metallisation
 - Screen printing
 - Hot embossing
 - Ultrasonic bonding
 - Device characterisation





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- Associated facility includes:
 - Laser ablation
 - Precision milling
 - Micro-injection moulding
 - Analytical laboratory includes:
 - GC-MS with headspace preconcentration
 - LC-MS, ICP-MS
 - Fluorescence microscope and lifetime
 - SECM and SEM
 - Tissue culture

