



DVT- IMP

Deep Vein Thrombosis Impedimetric Microanalysis System

**A novel device to improve deep vein thrombosis
diagnosis**

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DVT-IMP: Deep Vein Thrombosis – Impedimetric Microanalysis System

<http://www.diagnosingdvt.com/>



Our overriding 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





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**

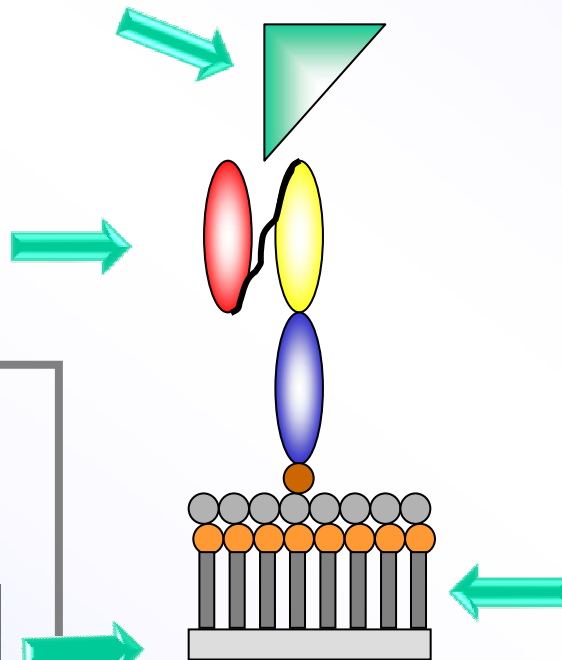
Analytical approach Overview



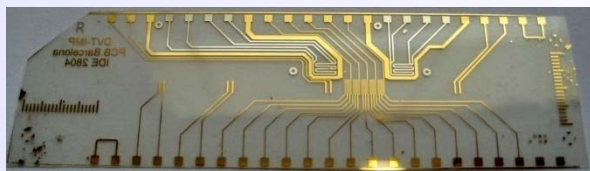
“model” recombinant antibody fragment with His tagged and appropriate antigen



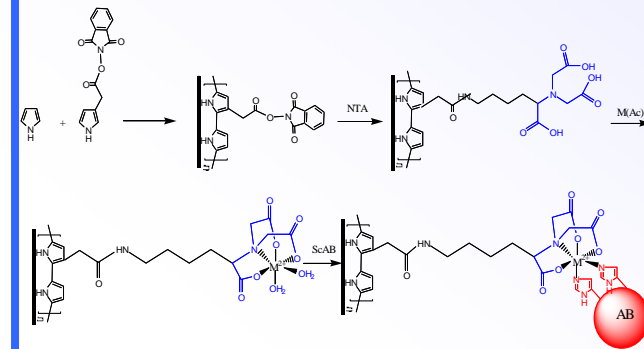
Impedance measurements
Dynamic range of detection of the antigen



IDE microelectrodes
Chips electrodes



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



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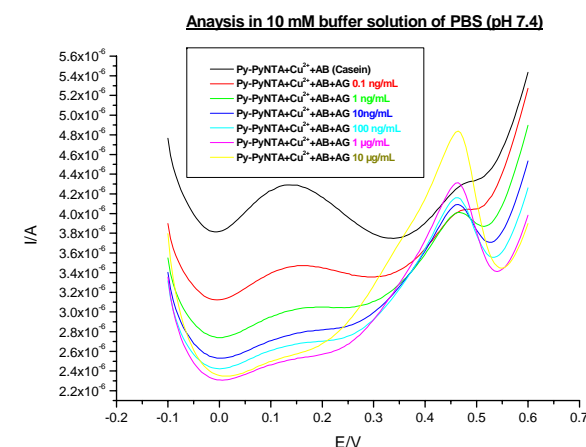
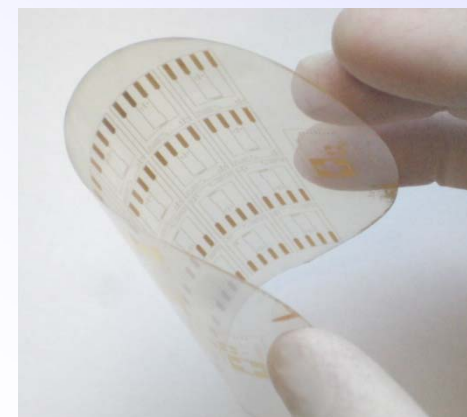


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Key Achievements - 1

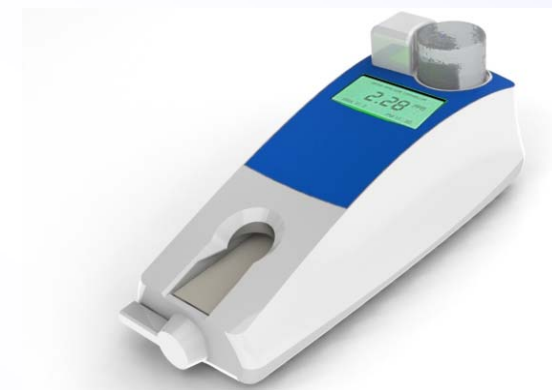
- **Biolayer optimisation and analytical analysis on PEN film**
 - Impedimetric detection of D-dimer clinical plasma sample
 - Specificity of binding of ScAb to the D-dimer confirmed using Surface Plasmon Resonance
 - Polypyrrole with NTA and Cu^{2+}
 - $0.1 \text{ ng ml}^{-1} - 1 \mu\text{g ml}^{-1}$
 - Polypyrrole with carbon nanotubes
 - $400 \text{ ng ml}^{-1} - 2 \mu\text{g ml}^{-1}$
 - Polypyrrole with gold nanoparticles with NTA and Cu^{2+}
 - $0.1 \text{ ng ml}^{-1} - 10 \mu\text{g ml}^{-1}$





Key Achievements - 2

- **Optimisation of microfluidic cartridge for D-dimer assay**
 - Improved fabrication quality of electrode layer: dimensional accuracy, metal adhesion, fabrication efficiency
 - Improved 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





Limitations, Future Challenges & Collaboration

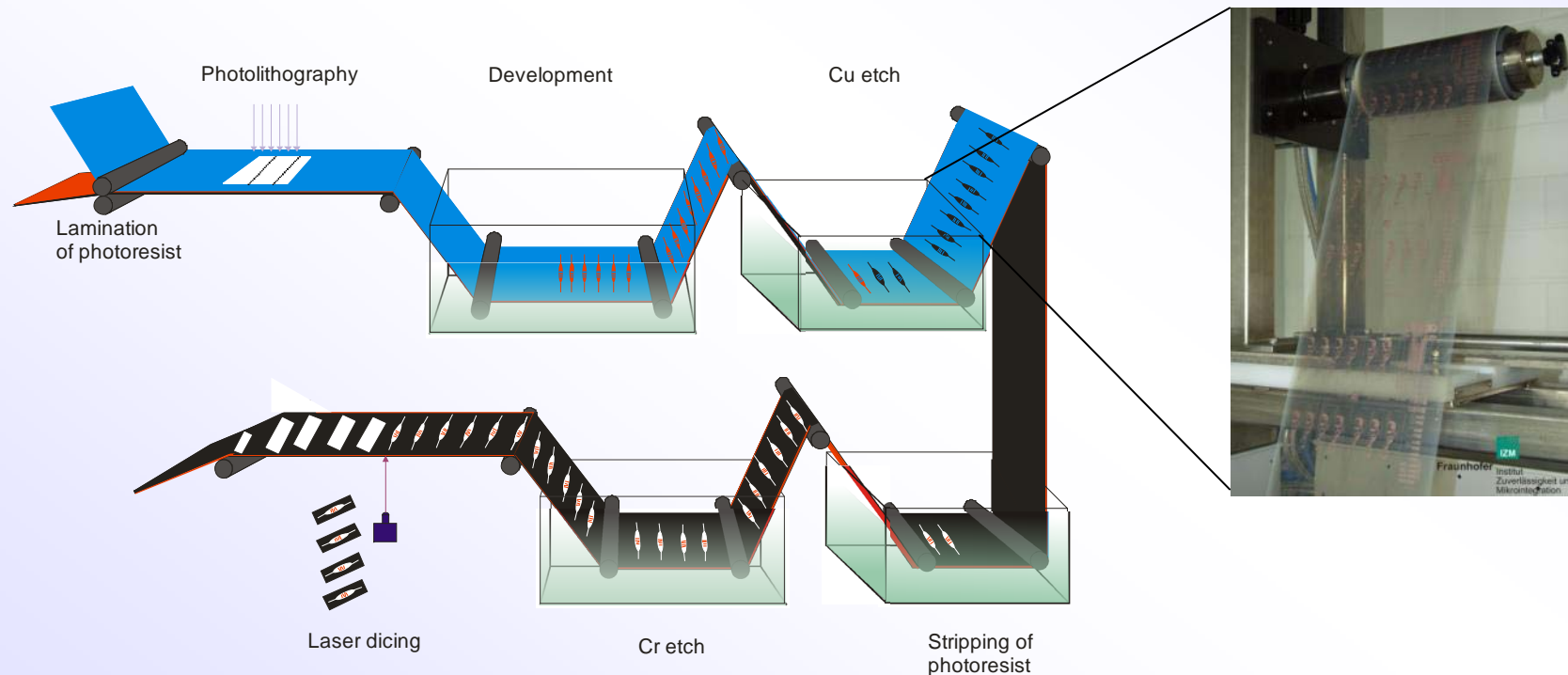
- Application development for a variety of sectors including food, defence, veterinary and medical
- Array based detection
- Increasing sensitivity without compromising on dynamic range
- Increasing effective area and/or accessibility during hybridisation of integrated electrodes





Limitations, Future Challenges & Collaboration

- Completely foil based microsystems





The Consortium



Teesside University – Project Coordinator
Claude-Bernard University-Lyon
Comenius University, Bratislava
Helena Biosciences
Parc Cientific de Barcelona
Fraunhofer Gesellschaft
Budapest University of Technology & Economics
Universit  Paris-Sud
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