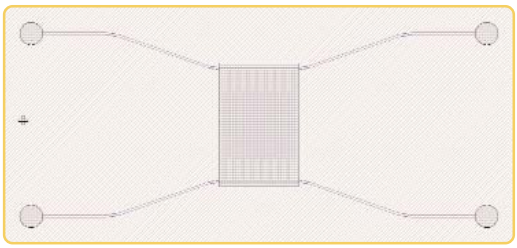
## INTEGRAMplus Recent results

A new enzymatic sensor was developed under the INTEGRAMplus FP6 project, with support from EPIGEM Ltd. (UK). The sensor is based on a deposited enzymatic layer (AChE enzyme), developed (concentration, enzymatic activity measuring, deposition protocol) for demonstration.



The enzymatic sensor layout

The acethylcholinesterase (AChE) immobilization was performed by ionic adsorption on chitosane or poly-ethilenglicol (PEG) bio-polymeric substrate, by including in the gel. The method for enzyme complexation to this support is simple, being based mainly on the potential interactions between the rests of amino acids from the enzyme molecule, the cationic character and the non-solubility of chitosane at high pH values. The membrane was obtained by drying the gel in air flow and loosing of water molecules facilitates the enzyme accessibility to the support linking sites, by the interactions between the rest of polar and non-polar amino

The main advantage of this method is that the enzyme immobilization is performed at room temperature, in aqueous environment, assuring an adequate homogeneity of the sample and reducing the possibility for enzyme inactivation. The sensor substrate is Si with gold interdigitated electrodes on top. The plasma treatment in $O_2$+Surface functionalization with APTS (3 aminopropiltrietoxisilan), 0.1μL have been performed. This way, the accurately deposition and immobilization only on the surface of the working electrodes has been achieved. The plasma treatment in $O_2$+Surface functionalization with APTS (3 amino-propiltrietoxisilan), 0.1μL have been performed. The sensor substrate is Si with gold interdigitated electrodes on top.

The microelectrodes fabrication was based on a Si substrate, p type, 16Ωm, oxidation, Ti/Au deposition, patterning, PSG 4% deposition leaving openings for the pads connections and biomaterial deposition. The functionalized electrodes deposited with biomaterial have been inserted into the microfluidic channels and tested from electrical and microfluidic point of view, achieving the micro/nano bio integration. Insertion of electrolyte plus choline into the channels is leading to activate the enzyme and the measurements have been done under the strict control of temperature and pH and will be presented. The sensitivity and selectivity of the sensor have been measured and calculated, using a LabView-based environment.

**INTERGRAMplus, IP, Priority 2 -IST, FP 6, Contract no.: 027540; 2005-2007. Coordinator: QinetiQ Ltd, UK. http://www.integramplus.com;**
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## Molecular Imaging Lab-on-a-Chip

*MI-lab on chip-Lab-On-A-Chip Implementation of Production Processes for New Molecular Imaging Agents*. **Acronym**: **MI-lab-on-chip**, STREP-FP6, NMP, 2005-2008, Contract No.516984 **Coordinator: Liege University,** Belgium;

The purpose of this project is to develop multiple steps radio-pharmaceutical chemistry processes at the micro molar scale in disposable, automated and miniaturized systems to be used at the time the products are injected to the patients.

**Molecular Imaging Lab-on-a-Chip** - *Year II of the project*

An overview of the activities carried out by IMT in 2007, including a description of the progress in relation with project's objectives during period. Besides "basic" functionalities required by the lab-on-chip concept such as valves, pumps, reservoirs, mixers, filters, heaters, for which successful concepts have been demonstrated, other specific functionalities needed to be developed. Main design options were identified to allow such different functions, and consequently different manufacturing techniques to be merged onto a single component. As being the only one partner in the project responsible for modeling and simulation, IMT specific activities included:

• Optimisation of pumping cycle as function of geometry, dimensions and pressure

• Simulation of fluids flow in specific channel geometry of actuating system

• Simulation of heating of the liquid enclosed in a cavity by means of different methods (electro-thermal and absorption of laser radiation)

• Filter simulation (for retaining solid phase resins having grain diameter larger that 20 μm, into cavity)

The 2nd year meeting of the MI-lab-on-Chip project was organized by IMT on October 19, 2007, Sinaia, bringing together the involved researchers in this European project.

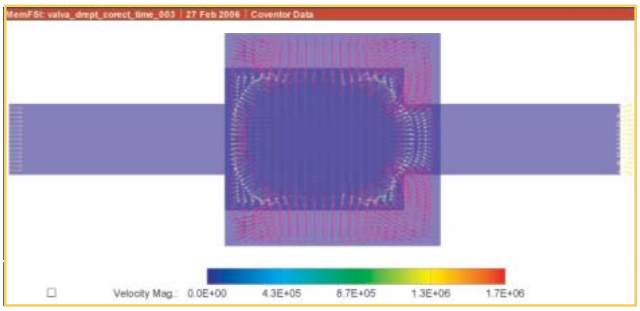


Figure 1. Transient simulation of a rectangular valve opening at p=0.01 MPa; velocity field distribution at t=0.2 seconds

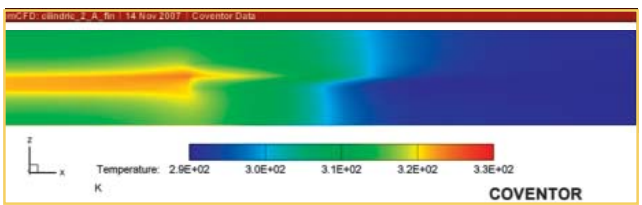


Figure 2. Heating of the flowing fluid through the chamber. The temperature distribution in the chip at thermal equilibrium (cross-section view along the channels; inlet on right side)

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