BIOMEMS Group

Highlights (2013-2018)

lemn Institut d'Electronique, de Microélectronique et de Nanotechnologie **UMR CNRS 8520**

Permanent Staff on 1st January 2019 (4,4 ETP) : Michèle CARETTE (Ass. PR.), Thomas DARGENT (Ass. PR), Jérôme FOLLET (Ass. PR), Cagatay TARHAN (Ass. PR), Vincent THOMY (Ass. PR), Anthony TREIZEBRÉ (Ass. PR), Céline VIVIEN (Ass. PR), Alexis VLANDAS (CR). Non-Permanent Staff: 2 Engineers, 10 Ongoing PhD, 10 PhD defended (2013-2018).

Controlling (non) wetting properties for anti-bifouling surfaces

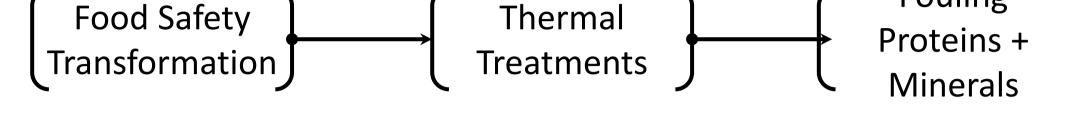
3 different surfaces tested:

Oversizing -

Contamination

ZOUAGHI S. et al. ACS Appl. Mater. Interfaces 9, 31 (2017) 26565-26573 / ANR Economics 2018-2021

Durability of Slippery Surfaces



- 80% of Dairy production costs are related to Cleaning Costs 🛛 🛶 fouling
- Urgent need for fouling mitigation solutions

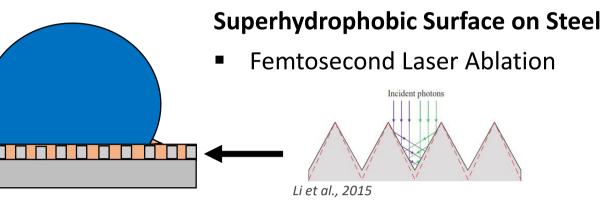
Contact: vincent.thomy@univ-lille.fr

Objective: to use and test Steel based Slippery Liquid-Infused Surfaces in pilot fouling test:

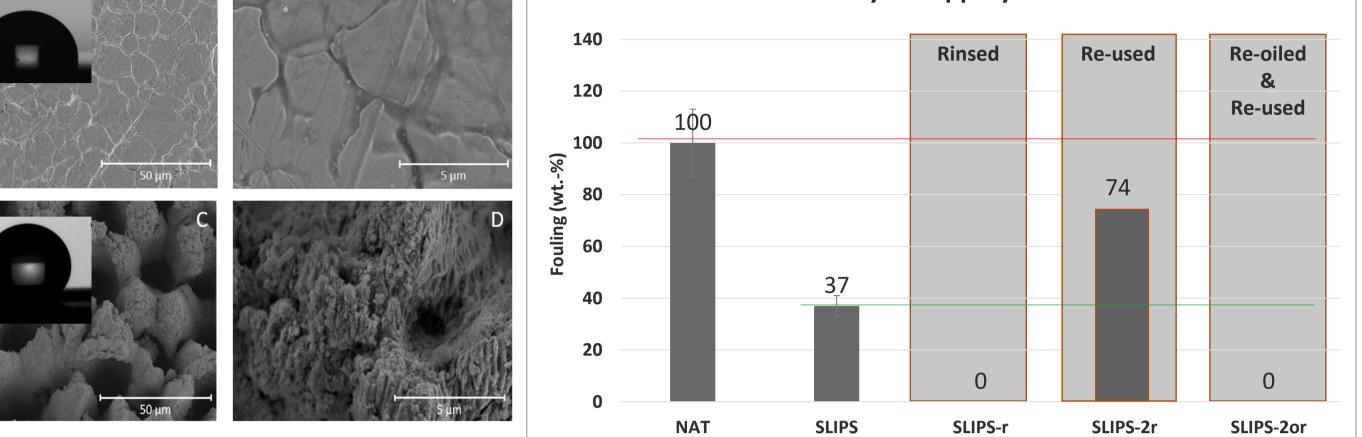
- Lubricant impregnated surface leading to Smooth liquid interface
- Non adhesive, easy-to-clean surfaces with quasi null hysteresis

Native steel surface (NAT)

- Textured surfaces (Tex) obtained by laser ablation
- Slippery surfaces (SLIPS): textured surfaces impregnated with inert oil
- Surfaces tested in a pilot fouling test (500L flow of a model milk like fluid during 1,5 h)



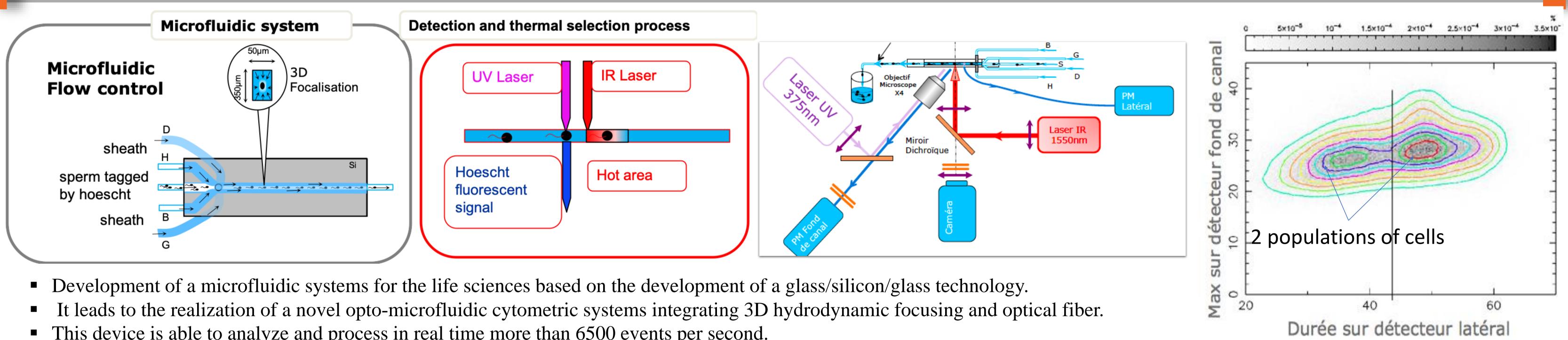
Chemical modification: Fluorosilanization



• Compare to native steel surface, SLIPS surface showed great fouling release properties:

- 73% (SLIPS) and down to -100% after a simple water rinse.
- A reuse of the same surface area shows a deterioration in performance due to loss of oil in the dairy environment (SLIPS-r)
- A fouling release of -100% is found after oil reimpregnation (SLIPS 2or))

High throughput opto-microfluidic cytometer devices



Coll. Y. Coffinier (NBI-IEMN), UMET, INRA

Inkjet printing of

polymer

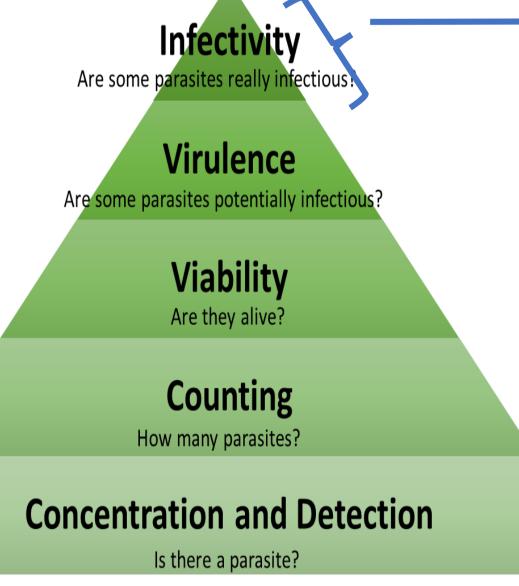
(64 testing positions)

• This device is able to analyze and process in real time more than 6500 events per second.

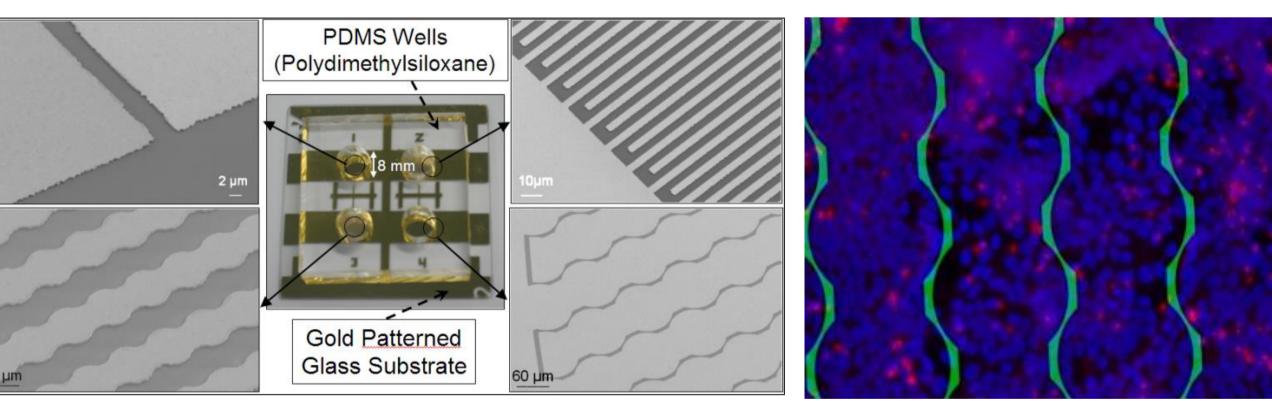
Industrial contract with biotech partner (1 000 keuros for 4 years): 2 patents Coll. With PhLAM laboratory (ULille-CNRS) Contact: anthony.treizebre@univ-lille.fr

Development of Electric Micro-System based devices In the study of *Cryptosporidium* parasite

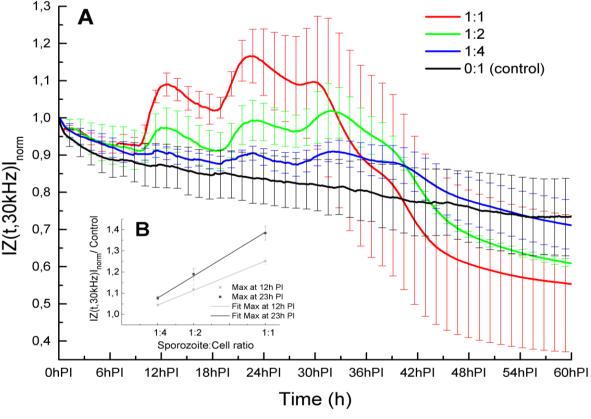
Impedance spectroscopy



Africa Asia, and In second cause of severe diarrhea leading to death in children under 2 years of age. Excystation No medicine nor vaccine for humans or animals parvum oocy health is available EWOD



The MEMS device was design in the clean room and electrically characterized. Human adenocarcinoma cells (HCT-8) were therefore seeded and grown on this network of interdigitated planar microelectrodes. Cells were then infested with C. parvum oocysts.



The continuous measurement of the impedimetric cell layer response has led to characterize the parasitic infestation.

Risk Analysis due to Cryptosporidium

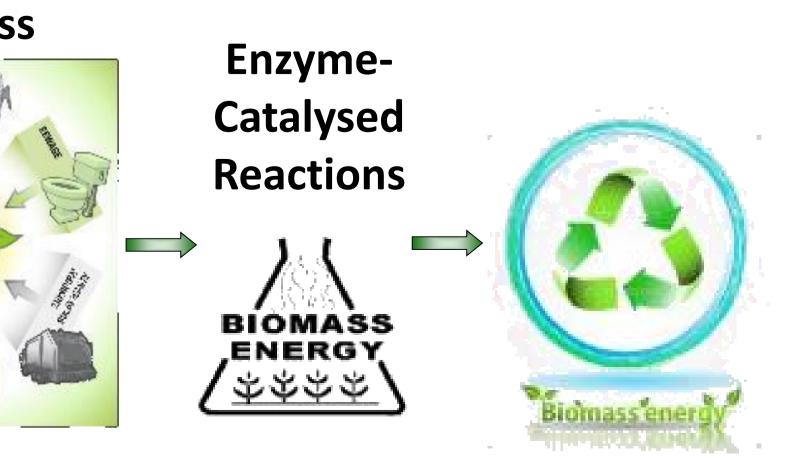
Contact: jerome.follet@yncrea.fr

Dibao-Dina A. et al, 2015 Biosensor Bioelectronics and Lejard-Malki R. et al., 2018, 18, 3310 – 3322 Lab-on-Chip

Inkjet printing of biopolymers

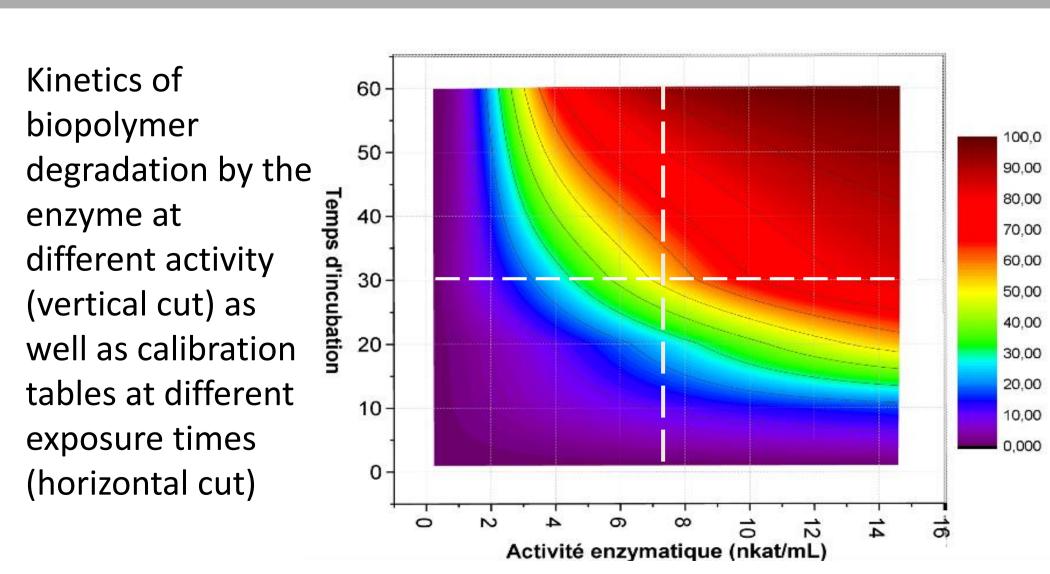
Biomass





- The valorization of biomass is an essential issue: biofuel, bio-refinery, etc....
- For the separation and degradation of biopolymers, enzymes play an important role.
- We have developed a new approach to measure enzymatic degradation activity.





- Brand new enzyme activity measurement strategy
- Based on Micro/nano fabrication / 2 patent applications



100,0

70,00

60,00

50,00

40,00

30,00



- Start up created January 2019 Focused on animal/human nutrition and biomass transformation markets • Winner of I-Lab 2018 competition
- Awarded starting grant by LMI

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https://www.iemn.fr