Magnetic Microsystems

applied to Medical Technologies & Devices

G2Elab — Grenoble Génie Électrique / Grenoble Electrical Engineering

Bridging between Magnetics & Microtechnologies

- Exploit scale reduction laws: enhanced magnetic interactions
- Exploit local hotbed of specific magnetics skills
- Design original devices : innovation & technology transfer

Medical devices & environmental bio-sensors
Local partnership for Bio-MEMS innovation:

G2Elab · LMGP · Néel institut · IAB · croma

- Systematic partnership with local laboratories (LMGP, I.Néel, CROMA)
- cross-disciplinary expertise (magnetism, biology, MEMS, µ-fluidics…)
- shared technological platforms (within FMNT & CIME-Nanotec)

2 startups

Linksium

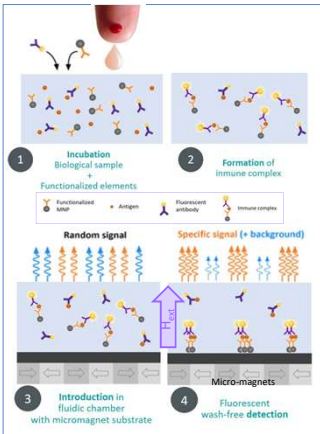
Med-Tech:
portable medical devices (2017, *Kauffmann et al.*) — MagiA diagnostics

Micro-energy:
Hybrid energy harvester (2013, Delamare et al.) — enerbee

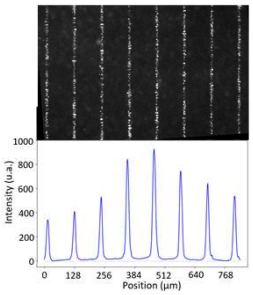
Point-of-care immuno-diagnostics devices

Quantitative screening of infectious diseases panel: HVA-HVB, HIV, Syphillis
One-step no-wash protocol (differential fluo detection)

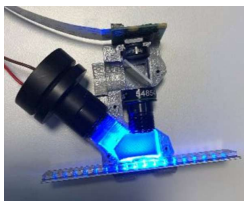
- integrated micro-magnets + magnetic nanoparticles
- lab-on-chip LoC : portable immuno-assay
- ultra-fast : 2 hours => 10 minutes
- passive micro-fluidics => no pump, no valve
- miniaturized micro-wells => reactive volume & costs /10



Superparamanetic nanoparticle capture on micro-patterned magnetic substrate

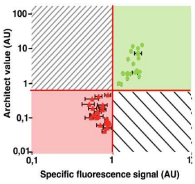


Fluo image of captured nanoparticles and Z-integrated fluo intensity profile

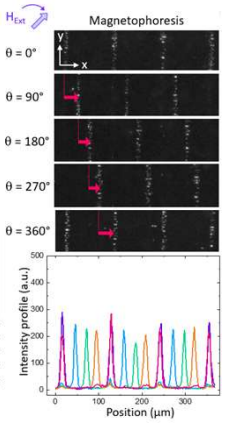


Minaturized fluo-detection unit for chronic renal patients

Point-of-care multiplex reader and disposable HBV diagnostics kit

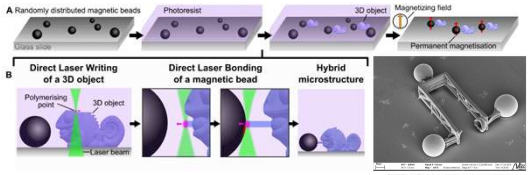


Double blind benchmarking MagIA vs. Abbott Architect



Lateral transportation via rotating magnetic field

Contactless micro-manipulation of magnetic micro-robots



Remote controlled magnetic micro-robots (2-photon 3D nano-printing)
NdFeB µ-spheres attached to collagen-ormocomp hybrid structure.

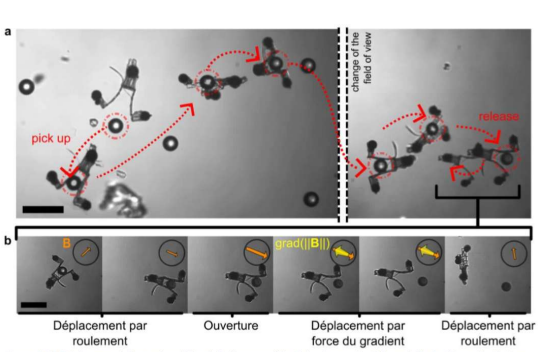
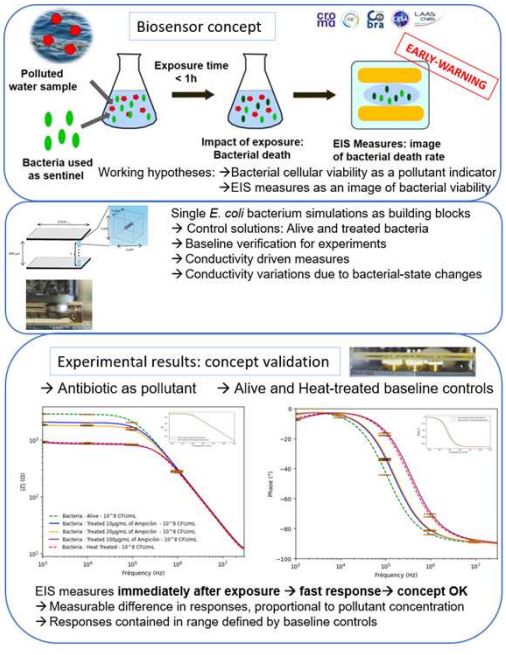


Figure 5-26 Déplacement d'une micro-bille. a) Action complète de la pince qui saisit une bille de 40 µm, la déplace puis la relâche. b) Détail des actions et du champ magnétique associé pour relâcher la bille.

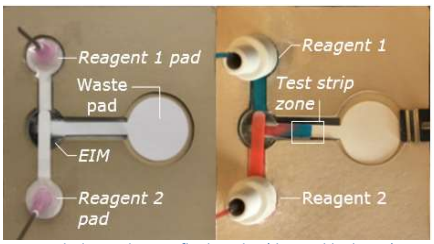
PhD V. Vieille & R. Petrot (Funding: Carnot & LANEF)
Collab.: T. Devillers (I. Néel) & O. Stéphan (LiPhy)

Bacteria-based electrochemical impedance biosensing for early warning pollutant detection

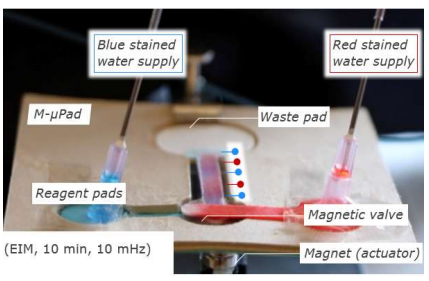


PhD A. Rico (collab CROMA, IGE ; Cobra, CBSA ; LAAS)

Colorimetric assay on magnetic paper



Multi-layered micro-fluidic valve (disposable device)
Laser-cut paper loaded with magnetic microparticles.



Remote actuation:
Multi-fluidic selective capillary delivery

PhD M. Fratzl (collab. I. Néel & Pagora)

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