MAMINA Team : « *M*atériaux et *A*coustique pour les *MI*cros **et** *NA*nos systèmes intégrés »

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

Researchers : Dorothée Callens (Pr), Pierre Campistron (MCF), Julien Carlier (Pr), Eric Cattan (Pr), Hatem Dahmani (MCF), El Hadj Dogheche (Pr), Sofiane Ghenna (MCF), Sébastien Grondel (Pr), Fabrice Lefebvre (MCF), Georges Nassar (MCF), Freddy Ponchel (MCF), Denis Rémiens (Pr), Caroline Soyer (MCF)

Scientific topics and issues

Materials
- Improve the performance of organic and inorganic active materials
- Work on environmental friendliness and biocompatibility

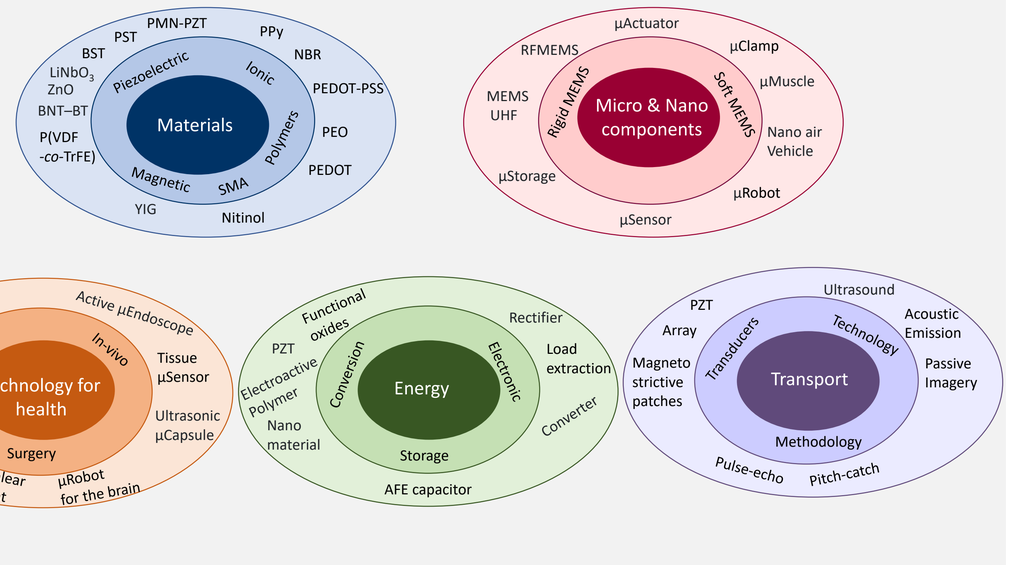
Micro & Nano components
- Integrating these new materials into micro- or nanostructures
- Combining micro- or nanostructures with microelectronic components

Technology for health
- Propose new devices to facilitate surgery and in-vitro and in-vivo diagnostics
- Create interdisciplinary and industrial links

Energy
- Develop vibratory energy harvesting devices
- Powering autonomous and/or connected objects

Transport
- Produce structural health monitoring systems
- Contribute to autonomous, sustainable and safe mobility

Working areas



Materials

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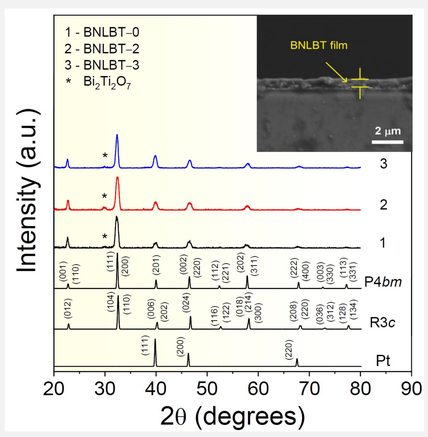
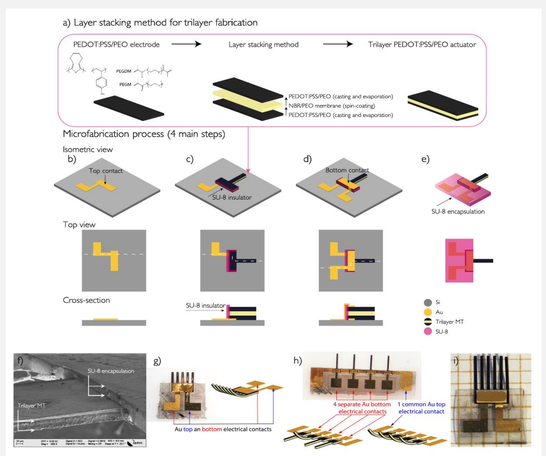
Piezoelectric



- Lead-free piezoelectric thin film (BNL-BT)
- Composite structures (BNLBT- P(VDF-co-TrFE)) and heterogeneous structures (PMN-PZT /YIG)
- $LiNbO_3$ thin films for 5G radio frequency filters

Ionic Polymers



- PEDOT:PSS-based µbeams, µactuators and µsensors fully integrated into flexible chips
  => first thin-film transducers operating in air

Micro & Nano components

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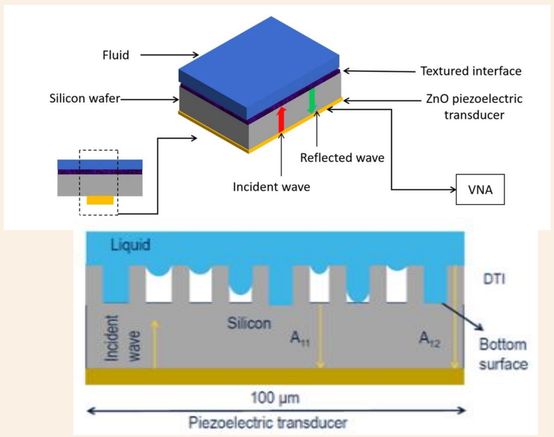
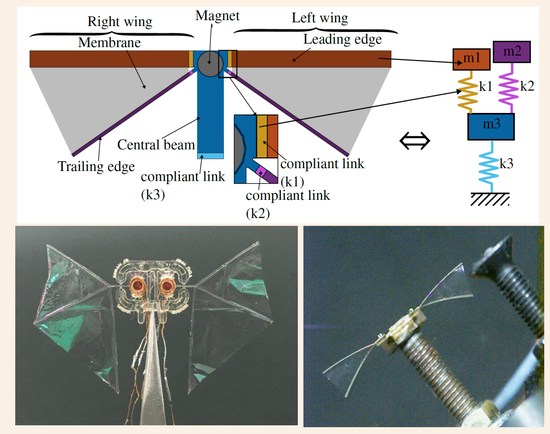
Acoustic reflectometry



- Ultra-high frequency acoustic device (up to 5 GHz) for characterising the wetting efficiency of a liquid droplet deposited on silicon surfaces with micro-nanometric patterns

Nano aerial robot



- µstructure capable of reproducing the movement of insect wings and generating lift
  => The world's smallest and lightest nano aerial robot

Technology for health

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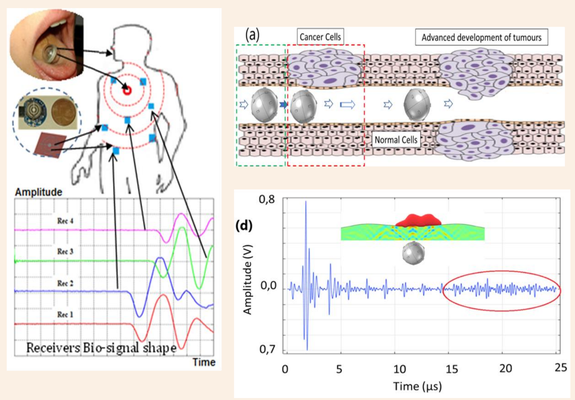
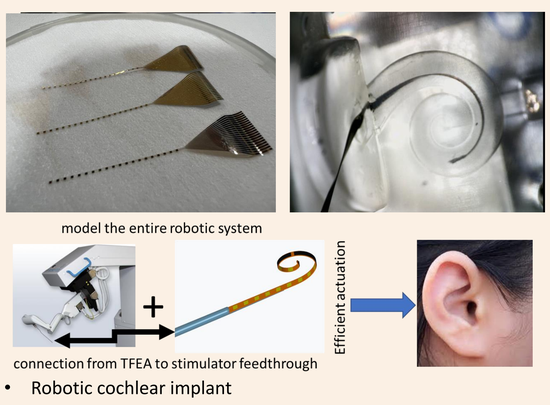
In-vivo and in-vitro diagnostics



- Endoscopic diagnosis using an autonomous ultrasound pill
- Smart actuators to make the micro-endoscope active
- Smart soles to study foot/shoe interaction
- Silicon micromachined cavity dedicated to ultra-high frequency imaging for microfluidic and microbiological applications

Microsurgery



- Robotic cochlear implant

- Surgical microrobot guidance system for the brain

Energy

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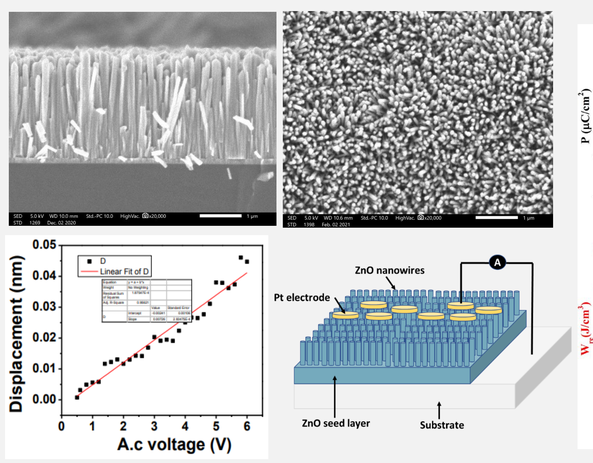
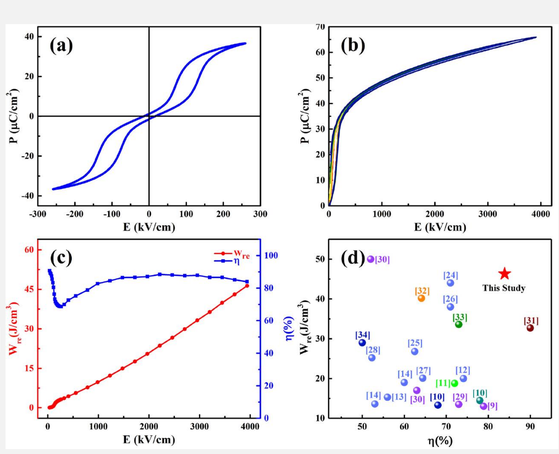
Conversion material



- Development and characterisation of ZnO nanowires with a piezoelectric coefficient d33 ≈ 5 pm/V

Storage material



- Anti-ferroelectric thin-film capacitors (PLZST) with high energy storage density, low energy loss and high stability
- BCTZ thin films characterization for vibration energy harvesting

Transport

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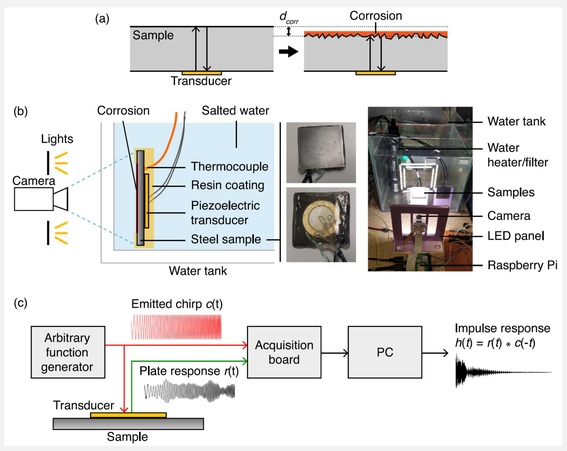
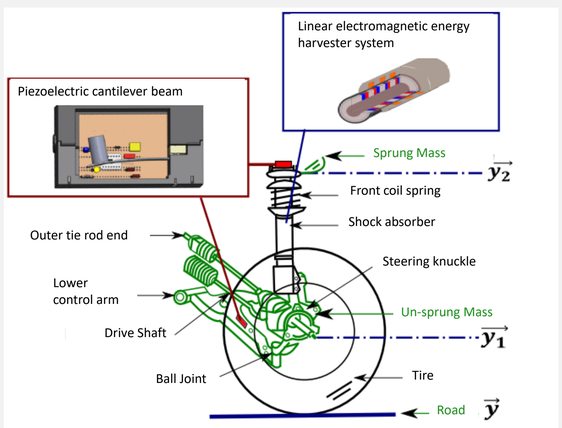
Structural Heath Monitoring



- Detection of corrosion on maritime platforms by coda emission
- Magnetostrictive patches for health checks on railway structures

Energy Harvesting system



- Comparison of the performance of vibration energy harvesting by electromagnetic and piezoelectric transduction on a motor vehicle suspension

Target path

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