Engineering of Nanomaterials, Biomolecules and Surfaces (NaBioS)

Nanostructured materials for biology and the environment

Context

Inspired by nature's architectures and interaction at biological length scales, nanomaterials open new pathways for sustainable bio-interfaces, environmental technologies and functional electronic devices.

Objectives

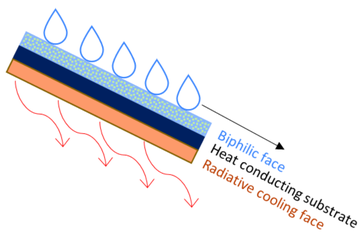
- Design eco-efficient sustainable nanomaterials.
- Integrate nanomaterials into smart, multifunctional devices through sustainable process.
- Apply to key domains: biologic (antibacterial, antifouling), technology (sensors, neuromorphic), and environment (water management, photocatalysis)

Skills and competences

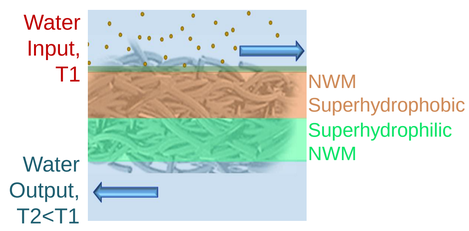
- Soft chemistry
- Surface functionalization
- Integration process
- Chemical, physical, electrical, surface characterization
- Modelling, Life Cycle Assessment

Water Management

From air to water



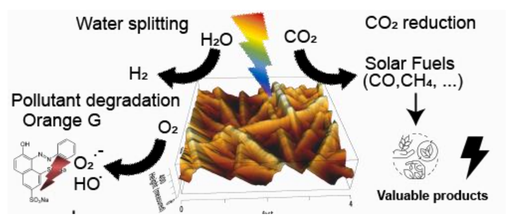
From salt to fresh water



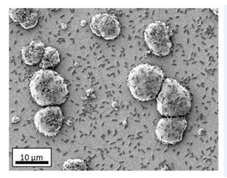
NWM nanowire membrane

Photocatalytic materials for environment

From CO_2 to value-added products

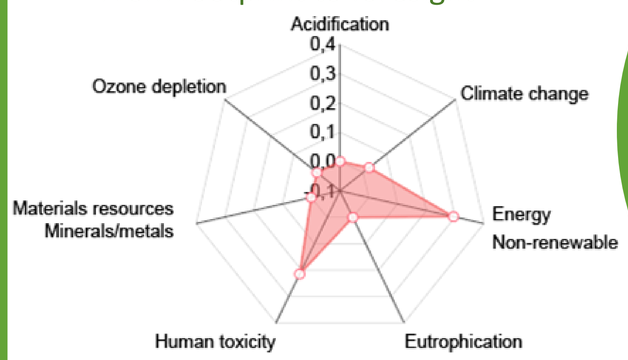


Marine Antibiofouling

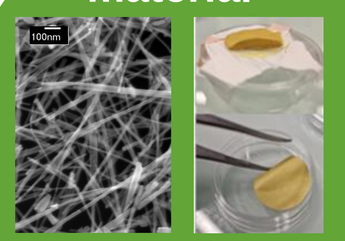


Life Cycle Assessment

From footprint to foresight



Key material

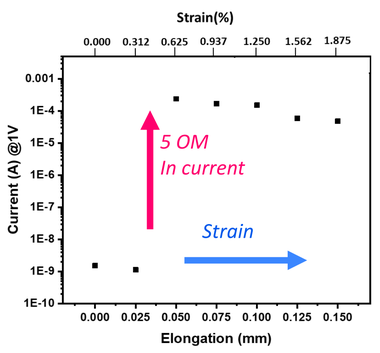


MOx nanowires and nanonets (ZnO, Cu_2O…)

Electromechanical behaviour

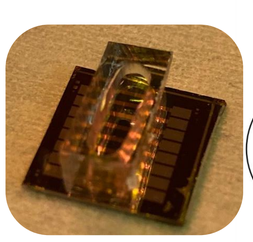
From deformation to new functionalities

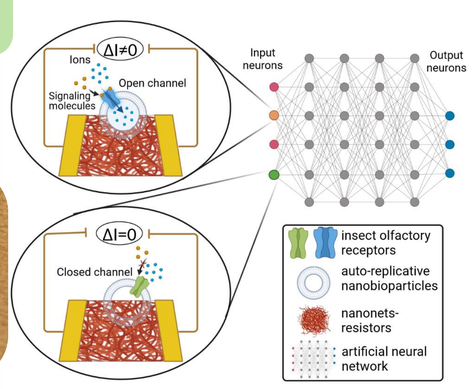
Mechanical-gated transistor



Biosensing with insect olfactive receptors

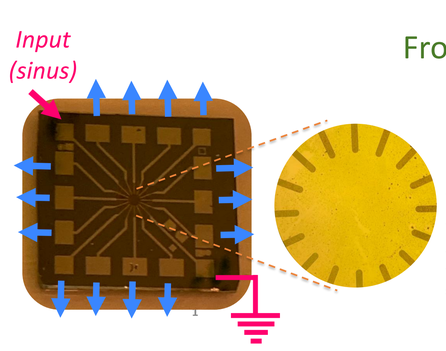
From nature to device



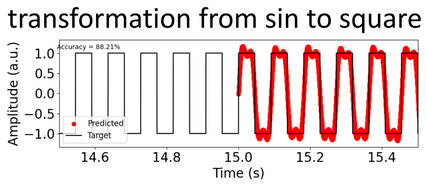


Neuromorphic devices

From material to computing



In-Materia non-linear transformation from sin to square



Output linear combination to form square, sawteeth…

Nanobiotechnology and biomimetic systems

Context

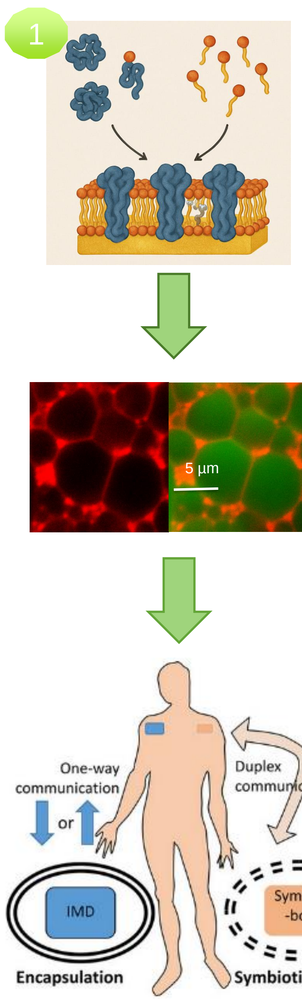
Construction of 2D and 3D functional soft matter interfaces by the self assembly of lipids, proteins and polymers *(scheme 1)*

Objectives

- Fundamental understanding of interfacial processes between biological tissues and soft matter;
- Lipidic compartmental systems for controlling ion gradients;
- Development of bioinspired nanoengineered systems for technology and medicine

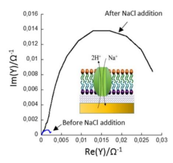
Skills and competences

- Advanced cell and molecular biology techniques;
- Large scale facilities;
- Microfluidics and 3D printing;
- Electrophysiology (SSM, patch-clamp);
- Biophysics, bioengineering, biomaterials, lipid biochemistry



Biomimetic Systems by Engineering Biology

Bio-batteries



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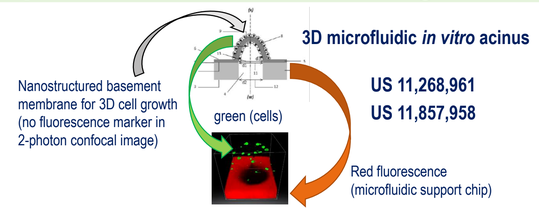
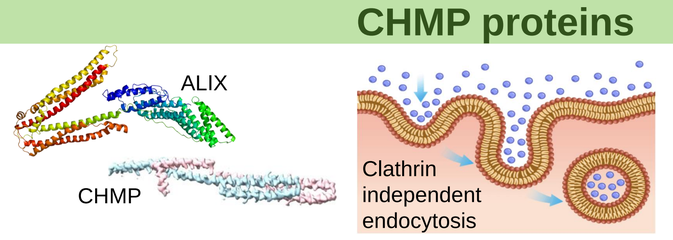
Bio-inspired cell secretome diagnostics

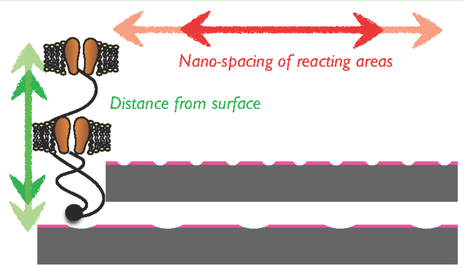


Biophysical changes in lipid bilayers induced by Alix and CHMP proteins



NEUTRONS FOR SOCIETY — ibs Institut de Biologie Structurale

Conformation and function of proteins at nanostructured interfaces



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CAPION : valorisation of bio-batteries

Flat structure possibility

- Paradigm shift — *recapitulates biology*
- No self-discharge
- Instantly reloaded — *autonomous, stable*
- Flexibility of shape — *coin cell or AAA size*
- Green, clean, renewable — *easier recyclability*
- Sovereignty — *No rare-earths nor metals*

bpifrance

Consortium de prématuration et maturation pour les batteries BATMAT (2023-2028)
Stratégie Nationale d'accélération « Batteries V2 »

More information :