



NAME : MATERIA NOVA

INSTITUTION : MATERIA NOVA

COUNTRY : BELGIUM

Profile :

To ensure their growth, businesses develop new products, directly brought about by technological innovations, on an ongoing basis. These innovations are the fruit of long years of research led by the university sphere. Strengthened by its internationally-recognised expertise, the University of Mons has created MateriaNova, a unique-in-Europe research and development centre.

In order to accomplish the challenges that are asked of it, Materia Nova works in close relationship with the university of Mons and also relies on its own capacities: an internal team of almost 100 globally-recognised scientific experts.

Activities :

- **Research and development:** in the field of material science to meet growing industrial demand for materials with improved properties, with Acceptable economic costs and Low environmental impact. Materia Nova has the task of leading specialised studies mainly on behalf of large enterprises and of encouraging the transfer of technologies between the world of basic research and the industrial world.
- **Services:** Our advanced analysis center allows:
 - **Analysis:** Solving company technical problems with efficient characterization tools.
 - **Consultancy:** Studying industrial processes to improve production tools.
 - **Support:** Lending our support to new technologies R&D projects (products/processes/metrology).

Expertise on following materials:

- (Bio)polymers and (Nano)composites
- Flame retardant systems & flame retarded materials
- Thermoset resins
- Sol-gel and Wetcoating
- Organic Electronics
- Chemical Sensors
- Electrochemical coatings
- Plasma Technologies
- Fermentation & Biocatalysis
- Biomass extraction and characterization

Actual research domains concerning materials technology / Competences:

- **Innovative and Sustainable Polymeric Materials**
 - Synthesis and formulation of polymeric compositions
 - Polycondensation, Polymer blending and compatibilization
 - Reactive extrusion
 - Improving fire behavior of polymeric materials by developing environmentally friendly flame retardant systems
 - Thermoset resins for composites, adhesives and coatings
 - Biobased polymers with improved anti-bacterial properties for food packaging
 - Self-healing materials

- **Cells for Materials and Materials for Cells**
 - Production of building blocks for polymers with bacteria using synthetic biology
 - Production of high added-value molecules, enzymes and nanomaterials
 - Development of novel bacterial and fungal culture strategies
 - Development of novel antifouling agents and strategies (non-toxic)
 - Testing: anti-biofilm, anti-algal, anti-bacterial, anti-fungal

- **Sol-gel and Wetcoating**
 - Protection of metals
 - Multifunctional surfaces: self-healing, easy to clean, anti-bacterial, anti-UV, mechanical and thermal resistance, ...
 - Wear and scratch resistance
 - UV resistance and Self-cleaning surfaces
 - Anti-dirtying, anti-graffiti, anti-finger print, anti-microbial
 - Sensitive and active layers for sensors (gas detection) and depollution

- **Organic Electronics**
 - Complete fabrication of optoelectronic devices
 - Definition of optimized device architectures
 - Study of the ageing processes for bulk heterojunction solar cells
 - Strategies towards Indium-free and new solution-processable electrodes
 - Encapsulation of the devices for their protection against air and water
 - Characterization of the device performances

- **Plasma technologies**
 - Enhanced corrosion protection of metal for use in severe conditions
 - Surface Hardening (ceramic, metal, polymer)
 - Polymer and ceramic doping for anti-static applications
 - Colored (hard) coating for decorative building application and jewellery
 - Wear and abrasion protection coating for tools lifetime increase
 - Non and conductive coating for electrical application
 - Optical coating for mirrors, filters (active or passive), absorber and Low-E application
 - Coating of powder
 - Depollution of effluent

- Environmental Impact unit

- Eco-Design in R&D projects through life cycle thinking
- Validate the presupposed greenness of the innovation project
- Quantify and optimize the environmental benefits
- Identify hotspots to focus eco-design efforts where they are most relevant
- Help companies in their eco-design approach

Available research infrastructure: Most relevant**- Innovative and Sustainable Polymeric Materials**

- Autoclave reactors for high/low pressure polycondensation under inert atmosphere
- Melt processing: single and twin-screws extruders, mini-extruders, interal mixers, injection/molding process, hydraulic compression presses
- Structural characterization: Size exclusion chromatography, FTIR, RAMAN, H NMR, P NMR, STEM-EDS, TEM-EDS, XRD, XPS-ESCA, ToF-SIMS, TEM-EDS, XRF
- Thermal analysis: TGA, TGA-FTIR/MS, DSC, DMA and rheometers
- Fire testing: cone calorimeter, UL-94 and LOI
- Mechanical testing: tensile, impact & compression
- Permeability tests for N₂, O₂ and CO₂

- Cells for Materials and Materials for Cells

- Laboratory Incubators and bioreactors (from 3 to 140 l)
- Microplate Readers, DNA sequencer, electroporation systems, colony counters
- CO₂ incubators,
- GC-MS, GC-FID, DNA, RNA and protein quantification, Glucose analyzer,

- Sol-gel and Wetcoating

- Climatic, corrosion, Kesternich and UV test chambers
- Coating characterization: cross-cut, bending test, pull-off, impact resistance test, Foucault thickness measurement, gloss, color, etc
- Coating stressmeter
- Contact angle measurement (Digidrop)
- Quartz crystal microbalance
- Rheometer (RS 150 HAAKE, Anton Paar)
- Nanosize/zetasizer
- Electrochemical characterization equipments: potentiostat/galvanostat, local electrochemical techniques (SVET, SKP)
- Electroplating pilot plant (for A4 plates)
- Gas analyser (combustion gases, atmospheric pollutants, ozone)

- Organic Electronics

- Electrical measurements (sheet resistance, resistivity by 4 point probe)
- Optical transmittance measurements and haze (UV-VIS + integrating sphere)
- Absorption and fluorescence spectroscopy (Spectrofluorimetry)
- Film thickness and surface roughness measurements with Atomic Force Microscopy



(AFM)

- Conductive AFM (C-AFM) for surface conductivity mapping and for the measurement of the local electrical properties.
- Peak Force TUNA enables current imaging with highest sensitivity and simultaneously provides topography and mechanical property information at higher spatial resolution.

- **Plasma technologies**

- PVD coating (Physical Vapor Deposition) inorganic coating synthesis (metal, nitride, carbide, oxide,...): coaters for flat substrate, 3D substrate, powder coating, inner tube surface
- PECVD coating (Plasma enhanced chemical vapor deposition) plasma polymer coating, industrial coater for roll to roll application, coaters for plasma research and for inner tube surface
- Plasma chemistry: microwave plasma systems, plasma induced liquid chemistry
- Atmospheric plasma technologies: Arc Atmospheric and Microwave plasma torch, Thermal spray
- Ion beam implantation based on micro-accelerator technology
- Plasma characterization: RGA mass spectrometer, mass spectrometer with energy analysis, optical emission spectroscopy, optical absorption spectroscopy in the visible range, FTIR characterization inside plasma phase, laser Induced Fluorescence, Langmuir probe

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