

## Smart materials and microsystems

Development of functional materials and integration technologies for advanced components, microsystems, and structural parts, material synthesis and characterization, manufacturing process tuning and to the proof of function in prototypical systems with industry standards and requirements..



### Polymeric Materials and Composites

- ▶ **Multiphase micro- and nano-composites** Electrical conductivity, shape memory, damage monitoring, piezoelectricity functionalized composites Innovative micro- and nano-structured polymer composites for additive manufacturing.
- ▶ **Tailored fibres** and matrix for enhanced mechanical properties.

### Synthesis of Innovative Materials

- ▶ **Additive manufacturing** tailored alloys, ultrafine grained steel, pillared graphene frameworks, anti-corrosive fluoroelastomers, metamaterials.
- ▶ **Synthesis of films** on porous material surfaces, RF-sputtering, DC-sputtering and pulsed laser, combination techniques, functionally graded materials via spark plasma sintering.
- ▶ **Additive Manufacturing tool powder development**, die powder 3D repair, 3D printing recycled polymers.
- ▶ **Bio-inspired materials**, spider silk & sil worm reinforced by graphene/carbon nanotubes, graphene based artificial polystyrene lotus leaves.

### Functional Materials and Photonics Structures

- ▶ **Multifunctional Carbon & Oxide** based materials, carbon based, nanostructured materials, Customised silicon photonics solutions for photovoltaics and data communication.
- ▶ **Transparent conductive oxides**, gold and hybrid gold/carbon nanotubes, nanostructures for drug delivery in cancer therapy, wavelength down-shifter materials in silicon-based, solar cells.
- ▶ **Photonics** neurophotonics, brain imaging and neuronal photoactivation in insect models, super-resolution microscopy, nuclear radiation detection, photons and bio-molecules, miniaturisation of photonic circuits, production of entangled photons, integrated optical circuit, topological photonics, integrated quantum photonic circuits.

### Advanced Treatment, Ceramics, Smart Building

- ▶ **Tailored PVD, CVD, PECVD** vacuum coatings, plasma, HVOF heat-shrinkable coatings, functional innovative porcelain glazes, micro and nano-structured grained composites, deep cryogenic treatment of tool steels post weld heat treatments corrosion inhibitors for steel.
- ▶ **Bioceramics**, materials for Solid Fuel Cells (SOFCs) and lithium batteries, extreme insulator nanobelts aerogel alike, programmed damage tolerance Ceramics Micro / Meso / Macroporous Ceramics.
- ▶ **Resonant metafoundations**, concrete composite connections, timber-based composite structures.

### Biomedical

- ▶ **3D printed tissue engineering**, in vitro 3D models, scaffold validation in in vitro systems, silk-based technology for tissue engineering, advanced drug delivery systems.
- ▶ **Bioactive materials for regenerative medicine**, prosthetic biomaterials, optimized nanostructured surfaces.
- ▶ **Modified-silica gel coatings** for medical polymers, numerical modelling, cinematic and structural, behaviour of prostheses.