

# MATERIALS TECHNOLOGY CLUSTER



## Research Profile

The Materials Technology Cluster groups the application-driven research activities and services to society at the different technology campuses of KU Leuven in the field of materials technologies. The cluster plays a crucial role in bridging the gap between fundamental and conceptual research on the one hand and industrial valorisation and implementation on the other, in both research-driven and demand-driven innovation contexts. Based on its research activities the cluster essentially contributes to the education and training of industrial engineers of the Faculty of Engineering Technology of KU Leuven, in particular in relation to materials technologies. The research lines of the Materials Technology cluster have been aligned with a number of other research lines at the Department of Materials Engineering (MTM).



## Research Topics

### Research line in collaboration with the Composite Materials Group

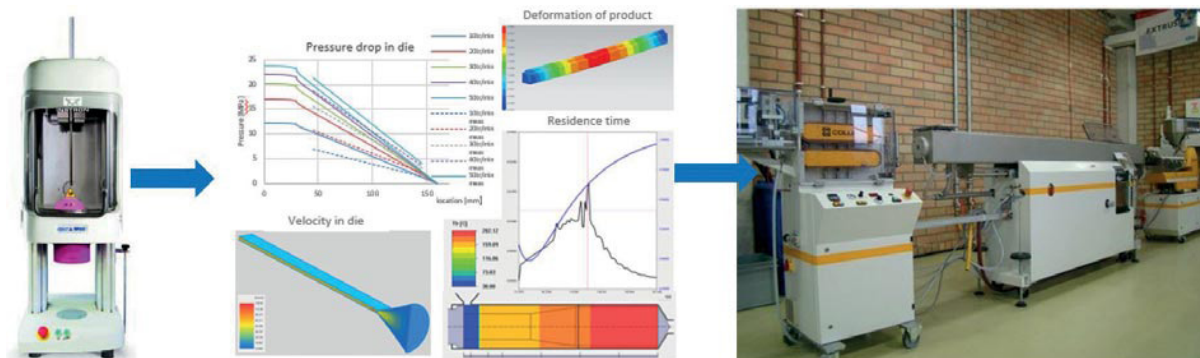
- innovations in impregnation and forming processes of polymers and composites Steel, concrete and composite structures
- innovations in liquid moulding techniques and hybrid manufacturing
- development of optimised fibre extraction and treatment methodologies for natural fibre composites
- optimisation of adhesive joining processes, especially with respect to fatigue
- development of protocols for durability assessment of polymers and composites
- optimisation and application development of foams and sandwich materials
- application development of durable (bio-) composites
- material characterisation and numerical simulations for multiscale material combinations

### Research line in collaboration with Metals and Alloys

- optimisation of plastic metal forming processes
- mechanical behaviour and applications of metallic materials
- optimisation of mechanical joining processes
- fatigue and fracture behaviour of joints

### Research line in collaboration with Materials Performance & Non-destructive Testing

- development of digital image correlation technology for displacement and strain measurement
- development of experimental-numerical methods for identification of (thermo)-mechanical and rheological behaviour
- industrial up-scaling of new tools for quality control during production, process monitoring and structural health monitoring



#### Research line in collaboration with Materials for Living Systems

- development of set-ups and procedures for monitoring and controlling cell and tissue culture in a bioreactor environment
- analysis of the effects of scaffold material and bioreactor design on cell behaviour

#### Research line in collaboration with High Temperature Processes & Industrial Ecology

- sustainability assessment of alternative (waste) treatment processes
- energetic valorisation of rest streams (waste incineration)
- toxic substances and elements in recycling processes
- application of computational fluid dynamics for sustainable design and optimisation of industrial processes

## Collaboration

An extensive network of companies, research centres and universities in Belgium and Europe has been developed through collaborative research projects, EU projects and consultancy.

## Unique infrastructure

- Processing equipment for composites (hot-plate, vacuum infusion, resin transfer moulding light, resin injection moulding)
- Processing equipment for metals (spot welding, arc welding, resistance welding, clinching)
- Processing equipment for polymers (compounding; extrusion; thermoforming; injection moulding: micro injection, water injection, gas injection, variotherm injection and two-component injection; 3D-printing; fused deposition modeling)
- Equipment for online monitoring of in vitro cell behaviour
- In-house developed software for digital image correlation (MatchID)
- Specialised mechanical testing (biaxial tension for foils and thin sheets)
- Mechanical testing (hardness, tension, compression, fatigue, impact)
- Chemical analysis (infrared spectroscopy, portable X-ray fluorescence)
- Physical analysis (capillary rheometers, melt flow indexer, "Vicat" heat distortion temperature determination, differential scanning calorimetry, contact angle measurement and surface energy determination, gloss measurement, colour measurement)
- Thermal treatments (ovens up to 1200°C)
- Dimensional metrology (3D coordinate measurement machines, portable measurement arms, LED assisted measuring devices, digital measuring microscope)
- Non-destructive testing (digital image correlation, ultrasonic devices, thermal imaging infrared camera)

## Contact

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*The research groups of the Materials Technology Cluster are active on the technology campuses in Diepenbeek, Ghent, Group T Leuven, Ostend and De Nayer Sint-Katelijne-Waver. In 2017-2018 the research of Campus Ostend will move to a new campus in Bruges.*