European Network of Materials Research Centres

NAME : CENTRE FOR MATERIALS SCIENCE AND ENGINEERING (CMSE)

INSTITUTION : GHENT UNIVERSITY

COUNTRY : BELGIUM

Profile :

The Centre for Materials Science and Engineering (CMSE) combines the broad expertise in Materials Science available at Ghent University. CMSE is a coordinating organisation of 13 departments in the Faculties of Engineering Science, Science, Pharmaceutical Science, Bio engineering science and Medicine working together at an **interfaculty** and **multidisciplinary** level. More than 300 persons, including around 50 professors and approximately 180 researchers, are working in the field of Materials Science and Engineering.
CMSE aims at cooperation in the field of materials science and the further development of this domain at Ghent University via activities on different levels. CMSE functions as coordinator of joint multidisciplinary national and international research projects and builds a platform for consulting / discussion regarding the vision on education and research in the field of materials science.

Activities :

- Education in the field of materials science : general training activities, but also specialised continuing education and organisation of workshops and conferences with regard to modern developments in materials science.

- Research and development in the field of materials science and the industrial applications on doctoral and post-doctoral level : applying research results in order to obtain material developments leading to products with a high added value; materials innovation. Stimulating the interdisciplinary and multidisciplinary research (properties, structure, applications, processing, modeling, …) in order to develop new materials, find new applications, optimisation of materials, …

- Service providing to the industry : offering a performant research infrastructure and research logistics, including scientific services; technology transfer in general.

Expertise on following materials :

- metals,
- (bio)polymers,
- biomaterials
- textiles,
- ceramic materials,
- composites,
- cement-based materials,
- electronics,
- semiconductors,
- wood and wood-based materials
- (antimicrobial) coatings
- biofilms
- chemicals
- magnetic materials

Actual research domains concerning materials technology / Competences :

- **Department of Dental Materials :**
  - Development and optimisation of bone cements – calcium phosphates
  - Development and optimisation of glass ionomer cements
  - Evaluation of dental composites
  - Study of the fluoride release of materials with regard to caries prevention
  - (De)mineralisation of biominerals
- **Laboratory of Wood Technology**
  - Wood preservation, modification, quality, finishing
  - Wood and environment
- **Department of Mechanical Construction and Production**
  - Fracture-mechanics of large-scale structural elements
  - Mechanics of fibre reinforced materials
  - Non-destructive material testing, characterisation and monitoring
  - Experimental mechanics
  - Tribological properties of materials
- **Department of Information Technology**
  - Integration and packaging technologies for opto-electronic and optical components
  - Microstructuring of materials by means of laser ablation
  - Electromagnetic properties of high frequency and microwave materials
  - Interaction of electromagnetic fields with biological materials
  - Acoustic noise absorbing materials
- **Department of Electronics and Information Systems**
  - Thin film coatings
  - Screen printing of thick film layers
  - Spin coating of organic dielectric layers
  - Electroless and galvanic deposition of metals
  - Dip coating of photosensitive epoxies
  - Conductive, non-conductive and anisotropic conductive adhesives
  - Solder & adhesive assembly of electronic components
- **Department of Electrical Energy, Systems and Automation**
  - Characterisation of magnetic materials
  - Numerical modeling of magnetic materials for the CAD design of electrical machines
- **Department of Metallurgy and Materials Science**
  - General physical metallurgy of steels
  - Stainless steels for flat rolled products
  - Advanced techniques for materials characterisation (AFM, ESEM)
  - Plastic deformation, recrystallisation and texture development
  - Solvent extraction
  - Non-ferrous casting technology and corrosion research
- **Department of Textiles**
  - Dyeability of polyester microfibres
  - Production of fibre reinforced composites by means of pultrusion
  - Use of thermoplastic manmade fibres and materials in sportswear
  - Modeling and optimisation of textile production processes
  - Simulation of textile structures
  - Non-wovens, Agro- and geotextiles

- Smart textiles
- Recycling of textile materials
- Extrusion

- **Department of Structural Engineering**
  - Concrete technology (high performance, self compacting, …)
  - Fibre reinforced (based on glass, aramid and carbon fibres) and pre-stressed concrete
  - Durability of cement based materials
  - Incorporation of waste materials in concrete
- **Department of Applied Physics**
  - Surface treatment by means of atmospheric pressure plasmas
  - Nano functionalisation of surfaces
  - Plasma synthesis of nanomaterials
- **Department of Solid State Sciences**
  - Surface physics, catalysis
  - Coatings, deposition techniques : e.g. PVD, CVD
  - Thin films
  - Basic research on reactive sputtering
  - Influence of the plasma treatment of coatings on their surface tension
  - Magnetron technology
- **Department of Inorganic and Physical Chemistry**
  - Ceramic coatings via spincoating, dip coating, flame spraying and spray pyrolysis
  - Physico-chemical and mechanical properties of ceramic composites
  - Thermal analysis, magnetic and electrical properties of solid materials
  - Kinetic studies of solid state reactions
  - Morphology of porous materials
  - Ceramic oxides with negative expansion coefficients
  - Magnetic separation
- **Department of Pharmaceutical Analysis**
  - Antimicrobial coatings on polymers
  - Surface modification of polymers (anti-adhesion of microorganisms)
  - Biofilms on surfaces

Available research infrastructure :

One of the objectives of CMSE is the development of a common research infrastructure that can be used by all members. In addition each of the participating departments has at its disposal a wide range of equipment and techniques necessary for the execution of the research mentioned above. An overview of the research infrastructure available at each department can be found through the CMSE website.

Coordinate address : **Centre for Materials Science and Engineering (CMSE)**
Ghent University
Technologiepark-Zwijnaarde 907, B-9052 Gent (Zwijnaarde)
Belgium

URL : **http://cmse.UGent.be**

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Contact persons :

Name :	**Prof. Dr. Paul Kiekens**	**Ir. Els Van der Burght**
Function :	**Chairman**	**Coordinator**
Tel. :	**+32 (0)9 264 57 35**	**+32 (0)9 264 57 56**
Fax :	**+32 (0)9 264 58 46**	**+32 (0)9 264 58 42**
e-mail :	**paul.kiekens@UGent.be**	**els.vanderburght@UGent.be**