



Luc Van
Meervelt,
Head of
department

The research activities of the Chemistry Department at the K.U.Leuven focus on the design and synthesis of new molecular materials for specific applications and on the study of their chemical, physical and structural properties.

The departmental staff of about 260 people is involved in both fundamental and applied research projects with a yearly research budget of about 3500 kEuro.

The reputation of our department attracts many students and researchers and results in a strong network with universities, research institutes and companies all over the world.

Department of Chemistry

I Research profile

The research mission of the Chemistry Department at K.U.Leuven is to develop and maintain leading research programmes with international reputation on fundamental and applied problems in the field of:

- the design, synthesis and characterization of new compounds (organic-inorganic, polymers)
- the simulation of the properties and reactivity of (bio)molecules and clusters by quantum chemical and molecular modelling methods
- the determination of the chemical and physical properties of (bio)molecules by spectroscopy, microscopy and other characterization tools as related to their structure.

I Keywords

Synthetic chemistry - combinatorial chemistry - spectroscopy - green chemistry - polymer architectures - computational chemistry - quantum chemistry - chemical pathways - chemical hydrogen storage - kinetics - biosensors - protein chemistry - signal transduction - crystallography - biomolecular modelling - docking - fluorescence correlation spectroscopy - single molecule spectroscopy - polymer blends - functional polymers - nanofotonics - magnetic nanoparticles

I Divisions

QUANTUM CHEMISTRY AND
PHYSICAL CHEMISTRY

The most important research projects in this division concentrate on:

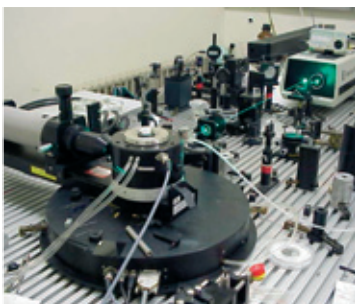
- the electronic structure of metal atoms and transition metal complexes in search for new properties such as magnetic and optical effects
- molecular networks to discover the architectural rules for clusters and biomolecules
- theoretical studies on organic and biomolecular compounds to predict properties and reactivity
- the kinetics of chemical reactions in the field of atmospheric, combustion, surface and interstellar chemistry at both the theoretical and experimental level
- the synthesis and characterization of nanoparticles for nanobiotechnological applications



I Contact

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www.chem.kuleuven.be



MOLECULAR DESIGN AND SYNTHESIS

This division explores the following topics:

- the design and synthesis of heterocycles, potential farmaca, modified dipeptides, dendrimers and hyperbranched polymers
- the chemistry and spectroscopy of rare earths (lanthanides), uranyl spectroscopy, metal-containing liquid crystals (metal-omesogens) and ionic liquids
- the use of ozone in the liquid phase, chemical processes in the semiconductor industry and gasphase reactions

A state-of-the-art instrumental park is available to purify and characterize the synthesized molecules.

MOLECULAR AND NANOMATERIALS

Among a wide variety of research topics the division focuses on:

- molecular interactions, phase behaviour and structure formation in supramolecular polymer materials and the synthesis of new polymers
- nanophotonics and the switching of linear and non-linear optical properties of chromophores at the molecular level for photonic applications
- submicron resolved chemistry and combined scanning probe and optical microscopy of nano-objects
- development and use of time and space resolved fluorescence spectroscopy

Impressive park of lasers, microscopes, spectrophotometers, DSC apparatus and rotating anodes is available.

BIOCHEMISTRY, STRUCTURAL AND MOLECULAR BIOLOGY

The present major research topics are related to:

- the direct observation of molecular interactions in the living cell via fluorescence techniques
- the structure, interactions, conformational dynamics and stability of proteins and nucleic acid fragments by simulations, modelling techniques, docking of small molecules to proteins and x-ray crystallography
- the regulation mechanisms during the defence of higher organisms against chemical and biological aggressors

The division is well equipped for protein chemistry, molecular biology, fluorescence spectroscopy, modelling of biomolecules and single crystal structure determination.

I Unique infrastructure

Extended parks for spectroscopy (NMR 600 MHz, FT-IR, UV-VIS-NIR, CD, and mass spectrometers), chromatography (HPLC, GPC), microscopy (fluorescence correlation, confocal, wide field, AFM, STM, MFM), mono- and multimode microwave reactors, extended computer clusters and graphical workstations, DSC park, laser park (eximer, dye, Nd:YAG, nano-, pico- and femtosecond lasers), rotating anodes, single crystal diffractometer, Langmuir-Blodgett troughs.

I Collaboration and users

Within the K.U.Leuven our departmental research groups interact strongly resulting in the participation in interfaculty research centers such as INPAC, BioMacS, Materials Research Center, in the research center in nanoelectronics and nanotechnology IMEC, and in many national and European projects for both academic and industrial research.

I Figures

31 professors

52 post-docs

130 researchers