DEPARTMENT OF CHEMISTRY AND BIOSCIENCE

EXPLORING THE BUILDING BLOCKS OF LIFE
FLIES AND FUNGI, SUPER POTATOES AND BIOFUELS

Research at the Department of Chemistry and Bioscience is diverse. We explore the building blocks of life to achieve new knowledge and provide platforms for industrial advances. The Department carries out education and research in chemistry, biology, biotechnology, environmental engineering and chemical engineering – including oil and gas technology. The research contributes to international state of the art and has impact on development of new technologies and products in industry.

CUTTING-EDGE FACILITIES
Theory and practice are combined in our research and teaching with an emphasis on collaboration with private companies and public sector organizations. The Department offers Bachelor (BSc) and Master (MSc) programmes, as well as regular PhD courses. All teaching follows the interdisciplinary Aalborg University model for problem-based learning (PBL), which is highly recognised both nationally and internationally. The problem-based project work - often in collaboration with industry - provides our students with tools for independent acquisition of knowledge, skills and competences and ensures high employability among our candidates.

have a highly professional scientific staff with strong national and international research partnerships. At our three locations in Denmark – Aalborg, Esbjerg and Copenhagen – we have seen an ongoing increase in student admissions (more than 700 students are now enrolled in our courses). We have new buildings and state-of-the-art lab facilities.

INNOVATING THE FUTURE
We aim to be among the leading research environments in environmental and medical microbiology, climate change biology, chemical engineering and biotechnology. This provides the basis for close interaction with industry and government bodies, resulting in new solutions to social and environmental challenges. The Department boasts a large number of projects, some address fundamental scientific challenges, others more applied topics that aim to meet the demands of industry and society. The research-based teaching founded on these activities provides the most important output: excellent candidates. The following pages will give you a brief introduction to our research.
RESEARCH AND TEACHING AT THE DEPARTMENT ARE ORGANIZED IN THE FOLLOWING SECTIONS:

- Biotechnology (Aalborg)
- Sustainable Biotechnology (Copenhagen)
- Chemistry (Aalborg)
- Chemical Engineering (Esbjerg)
- Biology and Environmental Science (Aalborg)
BRINGING BUILDINGS TO LIFE!

With modern technology and innovative solutions, we bring buildings to life. Our installation and service contracts cover buildings’ life-supporting functions: energy, heating, cooling, water and air. Through the installation of modern technical systems and regular service, we create the right conditions for sustainable growth.
PROTEIN CHEMISTRY
The relationship between structure and function of proteins is investigated, using recombinant protein expression, protein purification, and characterization. Examples of current research projects include the structure and function of metallo-proteases and their inhibitors, molecular regulation of the insulin-like growth factor system, molecular mechanism for inheritable heart arrhythmia, calmodulin mediated calcium signaling, as well as proteome profiling of hibernating brown bears.

FUNGAL BIOTECHNOLOGY
Each year more than 25,000 people in the EU die of infection from drug-resistant bacteria. Focusing on filamentous fungi, which offer a rich source of natural bioactive secondary metabolites, this project aims to identify and provide novel antibiotics through new detection methods as well as research in biosynthesis and toxicity.

SUSTAINABLE BIOTECHNOLOGY
The group’s expertise covers biorefinery concepts using a wide variety of applications with special focus on the conversion of different biomasses into bioenergy and high-value products, such as advanced biofuels, biochemicals, enzymes and proteins. The group specializes in eukaryotic and prokaryotic microbiology, molecular biology, enzyme and process technology, and microbiological cell factories for biological conversion.

GREEN CHEMISTRY
Research in the manufacturing and recycling of biobased fuels, materials and chemicals using near and supercritical media, typically carbon dioxide, water, organic solvents or mixtures of water and solvents. As a starting point, the group works with waste products, such as waste from agriculture and industry, plastics from wind turbine blades and unused plant material that has potential to become our greatest resource.

CHEMICAL REMEDIATION
Primary research focuses on advanced water treatment and chemical and physical remediation of contaminated soil and groundwater. The group aims to develop optimized treatment strategies for various emergent contaminants in drinking water, groundwater, seawater, wastewater, process water, water from swimming pools etc. With in-house equipment, experimentation goes from lab to bench scale, while pilot scale tests are conducted alongside project partners.
Energy fact

Buildings cause more CO2 pollution than cars. In fact, more than 40% of the EU’s energy consumption is caused by the buildings that we work and live in.

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SEPARATION SCIENCE
The group specializes in characterization, dewatering and separation of complex organic suspensions, to understand how feed characteristic influences separation processes and how separation processes can be improved. Work includes a broad range of membrane processes, including the development of new membranes, while also exploring the use of membrane bioreactors in wastewater purification, nanofiltration for removal of pesticides from drinking water, forward osmosis for concentration of nutrients, and energy production from saltwater.

MATERIAL SCIENCE
Within material science, research focuses on the development, characterization and testing of materials, including polymers, composites, metals and ceramics. Interests include development of semiconductor coatings, inorganic polymers, paints, polymeric films, inorganic and organic membranes, development and reuse of composites. Focus is also on nanoparticle synthesis, developing and synthesizing semiconductor nanoparticles for self-cleaning surfaces based on photocatalysis and dye-sensitized solar cells.

AMORPHOUS MATERIALS SCIENCE
Amorphous materials are disordered or non-crystalline materials, which cover glasses, gel, structural disordered thin film and fibers. Amorphous materials science deals with the structure, dynamics and properties of glass state, glass-forming liquids and disordered materials. This is a highly disciplinary field, which involves both physics and chemistry. This field of science is a basis for developing a new generation of advanced amorphous materials and relevant technologies. In turn, the advancement of this field is achieved by continuous discoveries of new types of amorphous materials and also by enhanced understanding of the fundamentals of the amorphous materials.

SUPRAMOLECULAR CHEMISTRY
The group works on advanced functional materials and studies of their intermolecular interactions. This area of chemistry, beyond the molecular level, is vital in understanding how molecules interact and create larger assemblies in liquid and solid state. A key focus is novel molecules for specific binding/release of a targeted guest molecules, for example in the creation of drug delivery/controlled release systems. Research focuses on the applications of a group of molecules called cyclodextrins, their polymers, and opto-electronic conjugated polymers.

OIL, GAS AND EOR ENGINEERING
Research focuses on Enhanced Oil Recovery (EOR) processes that can potentially be applied to boost oil and gas recovery from the Danish North Sea. The group researches gas injection and water-based methods, comprising experimental and modelling activities, both considered of major importance. Targets span from fundamental understanding of the physics and the chemistry underlying the studied processes, to the analysis and the evaluation of EOR processes on a laboratory scale.
Uggerly Installation A/S congrats Aalborg University, with the new building for the Department of Chemistry and Bioscience.