SmartBIO - Advanced Bioresources and Smart Bioproducts

Towards Sustainable Bioeconomy



The Advanced Bioresources and Smart Bioproducts (SmartBIO) research program accelerates innovation in nature-inspired emerging technologies and **sustainable circular bioeconomy** strategies to support the transition towards a fossil-free society.

SmartBIO consists of active, **multidisciplinary** research groups from both University of Turku (UTU) and Åbo Akademi University (ÅAU) who utilize the synergy emerging from combining **basic research** with **applied science** and **engineering**, as well as extensive cooperation with industry.

The bread and butter of SmartBIO is to bring UTU and ÅAU bioeconomy researchers together to spend time and have think-tanks to facilitate the development of collaborative projects. Moreover, promoting **industrial contact** and excursions are an integrative part of the activities.

Applied Photosynthesis (UTU)

Applied photosynthesis research focuses on utilization of the model and native Nordic algae and cyanobacteria in wastewater remediation, biofuel and high-valuechemical production. The main goal is to reach high conversion of solar energy to targeted products using water and CO2 and sunlight.

Natural Materials Chemistry (UTU)

Materials Chemistry (UTU)

We explore new functional materials for different applications, mainly for energy storing and conversion. Our multidisciplinary research theme includes i.e. electroactive materials, MXenes, layered double hydroxides and carbon-based materials. Material characterization is an integral part of our research.

Electrochemistry and Electroactive Materials (ÅAU)

Process and Systems Engineering (ÅAU)

SmartBIO

We focus on process development, process modelling, process optimization and process simulation. The models are developed both for static and dynamic systems, where the dynamic models are especially used for process control applications.

Materials Informatics (UTU)

We combine first principles simulations, experimental data and artificial intelligence tools to optimize materials, processes and devices. The objectives of our crossdisciplinary initiatives are to design better functionalities and accelerate the development of novel technologies.

Our expertise focuses on the qualitative and quantitative analysis of organic metabolites, especially plant specialized metabolites. All our research aims for better understanding of the significance of specialized metabolites in nature and for their better utilization in various medical or other applications.

Industrial Chemistry and Reaction Engineering (ÅAU)

Our research focuses on catalysis, chemical kinetics and chemical reactor technology. The key domain in our research is process intensification through the development of new catalysts and new chemical reactors and the use of non-conventional forms of energy, such as acoustic and microwave irradiation. The reaction products are used as fine and specialty chemicals, components in green fuels as well as ingredients in pharmaceutical and alimentary products. The research at the Analytical Chemistry includes basic electrochemical and spectroelectrochemical characterization of conducting polymers and other electroactive materials to provide knowledge for further applications in chemical sensors, solar cells, fuel cells and batteries.

Regulation of Photosynthesis (UTU)

The research is strongly focused on the identification and characterization of cellular components and regulatory pathways which enable acclimation of photosynthetic machinery according to environmental cues. We aim at understanding how the different regulatory mechanisms interact, and what is the role of photosynthetic machinery in the regulatory network of a cell.

Natural Materials Technology (ÅAU) (associate member)

Our work primarily concerns such questions as how we could utilize wood and other plant materials in the production of new valuable biochemicals and biomaterials.

SmartBIO people and events



Inorganic Chemistry (ÅAU) (associate member)

A large part of the research activities at the Inorganic Chemistry is connected to the development of cleaner and more efficient combustion technologies. Our recent work has dealt with development of laboratory methods and modelling tools for prediction of the detailed behavior of various combustion processes.

Organic Chemistry (ÅAU)

Topical interests in the organic synthesis are stereoselective synthesis and catalysis, carbohydrate chemistry and natural product chemistry, whereas organic chemical analysis implies principally environmental analytics. We are especially interested in the occurrence of pharmaceutical residues in the environment.





Director: Professor Yagut Allahverdiyeva-Rinne, University of Turku, <u>allahve@utu.fi</u>

Co-director: Professor Henrik Grénman, Åbo Akademi University, <u>henrik.grenman@abo.fi</u>

www.smartbio.fi