The Research Platform for Biotechnology and Sustainable Chemistry (BioSusChem) of HES-SO Valais//Wallis is an interdisciplinary research group that brings together competences in applied research to serve societal, industrial and academic needs.

Mission: Initiate and inspire biotechnological and chemical innovation to address current and emerging challenges while providing sustainable solutions.

Priority areas include bioprocess engineering, biomaterials, bioresources, (bio)analytics, biocatalysis, sustainable energy & chemistry.

RESEARCH AREAS

(Bio)Analytics

STATE OF THE ART EQUIPMENT FOR RESEARCH AND SERVICES:
- (Bio)separations: LC (analytical & semi-preparative scale), LC-MS (qTOF, qqq), electrophoresis (planar, capillary) of proteins, antibodies, enzymes, active pharmaceutical ingredients
- Structure elucidation (NMR, FT-IR, MSn)
- Chiral analysis (LC, GC, CE, polarimetry)
- Elemental analysis (AAS, AES, ICP-OES)
- Biocompatibility (LAL test) and standardized in vitro cell assays (ISO10993 based methods)
- ELISA, enzyme activity, fluorescence assays
- Gene expression, transgene copy number, host cell residual DNA (qPCR)
- Method development & validation: ISO 17025 certified (analytical chemistry, microbiology, qPCR)

Sustainable Chemistry & Energy

CUSTOMIZED SYSTEM ENGINEERING IS PROVIDED IN THE FIELDS OF:
- Hydrogen generation by microbial electrolysis cell
- Bioethanol Refining
- Plasma technology for material treatment and analysis
- Electrolytic Hydrogen generation & conversion
- Photovoltaics
- Phosphate recovery from digested sewage sludge
- Methane production using bioelectric systems
- Microalgae as tool for solar-driven chemical production

Bioprocess Engineering

BIOPROCESS DEVELOPMENT FOR RESEARCH AND INDUSTRIAL PRODUCTION:
- Design and scale-up of batch, fed-batch and continuous cultivation of: aerobic and anaerobic bacteria, fungi, mammalian cells and algae)
- Strain development, (screening and selection of expression systems)
- Process analytical technology (PAT) for bioprocess optimization and scale-up from micro-bioreactor to 300 L
- Downstream processing: filtration, centrifugation, extraction, fixed and fluidized bed adsorption, chromatography, membrane separation from lab to pilot scale
Bioresources

RENEWABLE BIORESOURCES ARE INVESTIGATED FOR BIOLOGICAL AND CHEMICAL TREATMENT:
• Solids: Polysaccharides (cellulose and hemicellulose) and complex mixtures (food waste), microalgae
• Liquids: Industrial and municipal (organic) waste streams and waste from food industry
• Gases: CO2, H2, CO (syngas)

Biocatalysis

COMPLEX REACTIONS ARE CARRIED OUT BY DIVERSE ENZYME SYSTEMS:
• Stereo-, regio- and chemoselective enzymatic catalysis and whole cell biotransformation of waste into fuel products
• Synthesis of biosurfactants, biolubricants and biodiesel
• Stabilisation of enzymes by ionic liquids
• Rate enhancement of enzymatic catalyses using ionic liquids
• Inverse hydrolyses using solvent free enzymatic catalysis conditions

Biomaterials

PRODUCTION, PROCESSING AND (ANALYTICAL) CHARACTERIZATION OF BIOMATERIALS:
• Biopolymers, polysaccharides, proteins, peptides, DNA/RNA
• Tailor-made polyhydroxyalkanoates (PHA) for industrial and medical applications
• Medical implants (collagen substitute)

PRINCIPAL INVESTIGATORS

Simon Crelier, Ph.D.
Expertise: Biotechnology, DSP, enzyme technology

Franka Kalman, Ph.D.
Expertise: Bioanalytics, characterization and quality control of (bio)molecules

Sergio Schmid, Ph.D.
Expertise: Molecular biology, recombinant production and strain engineering

Fabian Fischer, Ph.D.
Expertise: Biotechnology, biocatalysis, chemical biotechnology & biofuels

Christof Ellert, Ph.D.
Expertise: Plasma technology, hydrogen production & conversion, system design

Manfred Zinn, Ph.D.
Expertise: Biotechnology, bioprocess engineering & biomaterials

CONTACT PERSON

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