Research topics

- Research subfield: **Carbon dioxide activation**
- Research subfield: **Methane activation & conversion**
- Research subfield: **Hydrogen & fuel cells & electrocatal.**
- Research subfield: **Pharmaceutical process engineering**
- Research subfield: **Biomass-derived building blocks**

Ongoing projects

**Horizon 2020:**
- **MefCO2**, Synthesis of Methanol from Captured Carbon Dioxide Using Surplus Electricity (SPIRE-02-2014)
- **Fresme**, Methanol from CO2 Blast Furnace gasses to be used as ship transportation fuel
- **nextBioPharmDSP**, Next-generation Biopharmaceutical Downstream Process (BIOTEC-4-2014)

**ERA-NET:**
- **Mar3Bio**, Biorefinery and Biotechnological Exploitation of Marine Biomasses (MarineBiotech - Marine Biotechnology ERA-NET)
- **RHODOLIVE**, Biovalorization Of Olive Mill Wastewater To Microbial Lipids And Other Products

**NATO SPS:**
- **984738**, Enhanced Portable Energetically Self-sustained Devices for Military Purposes (ESCD - Emerging Security Challenges Division); **coordinator**

**COST Actions:** 3

**Members of EERA – European Energy Research Alliance**

**Slovenian Research Agency projects:** 1

**Bilateral cooperation projects:** 2
PARTNER PROFILE: LIGNOCELLULOSIC BIOMASS VALORIZATION

• R&D on a lab scale
• Kinetic modeling, parameter estimation and sensitivity analysis
• Process simulation and optimization (CFD, DFT, Monte-Carlo, Aspen+)
• Downstream processing
• Scale-up (based on combined experimental and in-silico studies)
• R&D on a pilot scale
• Unit operations

AVAILABLE RESEARCH INFRASTRUCTURE:

High-throughput high-pressure reactor systems:
5 x parallel continuous fixed-bed reactors (in-house fabricated)
6 x parallel fully-automatized stirred reactors (Amar)

Individual high-pressure reactor equipment:
1 x Fully automatized fixed bed or trickle bed reactor (PID Eng&Tech)
2 x 1700 mL stirred reactors (Parr, SS-316 and Titanium)
1 x 300 mL stirred reactor (Autoclave engineers)
1 x High-temperature gradient plate-catalyst reactor (in-house fabricated)
1 x Reactor equipped with a scale for thermogravimetric analysis (Rubotherm)
1 x RC1e calorimeter with in-situ FTIR and FBRM probes (Metler Toledo)
1 x Fully automatized view-cell with highly-precise T and P sensors (in-house fabr.)

Analytical equipment:
3 x Two-module μ-GC (2 x Agilent, 1 x Inficon)
4 x GC–TCD (2 x SRI, 2 x Agilent)
2 x GC–MS/FID (1 x Agilent, 1 x Shimadzu)
1 x GC–FID (Thermo Scientific)
2 x HPLC/DAD (HP/Agilent, Thermo Scientific)
1 x UHPLC/DAD–RI (model known in May)
1 x FTIR with DRIFT, liquid–probe & gas–cell modules
1 x UV-VIS spectrophotometer (Perkin–Elmer)

Glass apparatus:
1 x Labmax (Metler Toledo)
1 x Ebuliometer (Fischer Sci)
2 x Pilot scale adsorption and destilation units

Characterization equipment:
1 x Physiosorption analyzer (Micromeritics ASAP 2020)
1 x Chemisorption analyzer with MS (Micromeritics AutoChem)
1 x Co-owners of scanning electron microscope (Carl Zeiss)
EXISTING EXPERIENCE: **LIGNOCELLSULOSIC BIOMASS VALORIZATION**

**PHARMACEUTICALS FROM EXTRACTIVES**

**LEVULINIC ACID**  
**γ-VALEROLACTONE**  
**PENTANEDIOL (1,2; 1,4; 1,5)**  
**GLUCARIC ACID**  
**ADIPIC ACID**  
**SORBITOL**

**INDUSTRIAL FURFURAL PRODUCTION FROM HEMICELLULOSE**

**EXTRACTIVES**

**HEMICELLULOSE**

Co-operation with industrial partner

**+H₂O, H⁺**

**Lignocellulosic Biomass**

**+Solvent, H⁺**

**CELLULOSE**

**LIGNIN**

AROMATIC AND CYCLOHEXANOIC COMPOUNDS

Co-operation with industrial partner
PROJECT IDEAS OF INTEREST (among others): BIO-BASED ADIPIC ACID and PHENOLICS