WIRE

Waste biorefinery technologies for accelerating sustainable energy processes

Exploring Integrated Systems for Biorefinery Applications: A Study of Thermochemical Processes at KIT-EBI

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05.10.2023

Working Group 3

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EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Funded by the European Union

About me

BSc Department of Biology, Hacettepe University, Ankara, 2007
Msc Department of Bioengineering, Ege University, Izmir, 2010
PhD Department of Bioengineering, Ege University, Izmir, 2014

Overseas experiences during PhD

1. Department of Civil, Chemical, Environmental, and Materials Engineering, University of Bologna, Bologna, ITALY, 2012
2. Department of Biosystems Engineering University of Manitoba, Winnipeg, MB, CANADA, 2013

Post-Doc

Overseas experiences during Post-Doc

1. COST FULLRECO4US - CA20133- STSM Grant – (11-21 Sep 2023) Norwegian University of Life Sciences, As, NORWAY
2. COST WIRE – CA20127 STSM Grant – (25 Aug-01 Sep 2023) Karlsruhe Institute of Technology, Karlsruhe, GERMANY
3. ERASMUS Teaching Staff Mobility Lecture Sessions (22-26 May 2023) University of Ljubljana, SLOVENIA
4. ERASMUS Teaching Staff Mobility Seminar Sessions (06-10 May 2019) University of Agricultural and Veterinary, ROMANIA

Co-founder

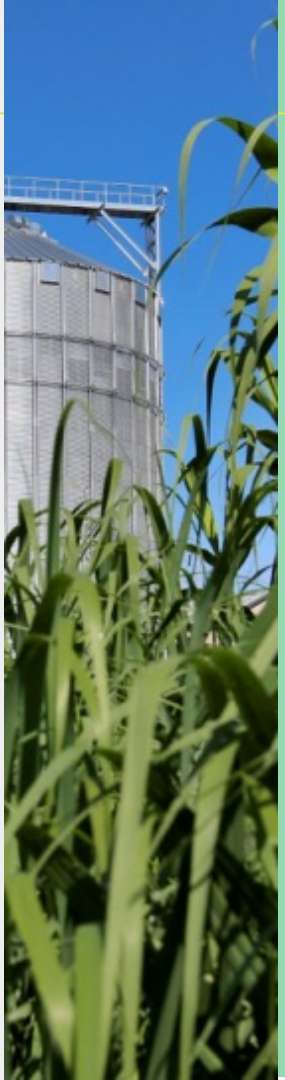
HOPE Biobased Solutions, Izmir, TR
https://www.hopebiotech.com.tr/

Outline

- Expectations of the STSM
- Activities during STSM
- Outcomes of the STSM
- Comments and final notes

Expectations

- Integration of new perspectives to my biobased expertise in alignment with the experimental practices of Prof. Rauch's group on chemistry-based technologies
- Potential collaboration and networking



- STSM Period: 25 Aug-01 Sep 2023
- STSM Location: Engler-Bunte Institute, Karlsruhe Institute of Technology (KIT-EBI), Karlsruhe, GERMANY
- STSM Host: Prof. Reinhard Rauch

Karlsruher Institut für Technologie

Introduction of the labs and discussions

Fischer-Tropsch (FT) synthesis: catalytic conversion of gases into liquid hydrocarbons

- operational parameters including temperature, agitation speed, catalyst type etc.

- Sustainable process by the use of renewable resources during the power generation processes under the scope of the Power to Liquid pathway.

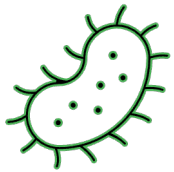
Fully automated reactor set-up, analyzers and control units

Introduction of the labs and discussions

The fully automated and remote controlled system instalments:

The software allows the observations of variables any time and where needed, allows to change the independent parameter range accordingly.

This is specifically interesting to be applied to the fermentation bioreactors that our group owns in Izmir University of Economics, Türkiye. Here we also want to examine the specific behaviour of our bacteria to reach higher efficiencies of the bioproducts we produce e.g. control of the gas feed by mass flow controllers and being able to remotely change them any time when needed.



The control panel

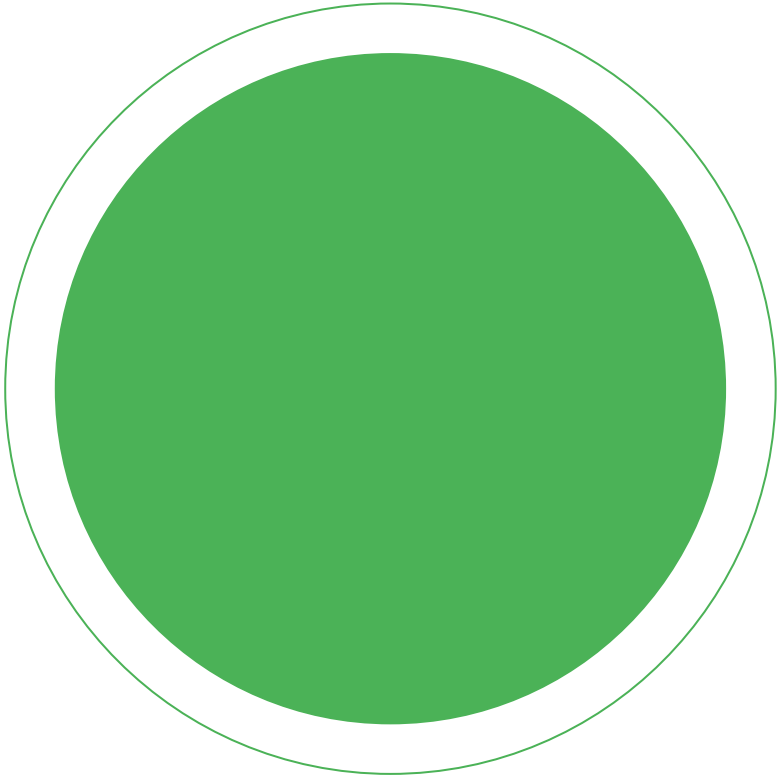
relevant connections for the FT system

mass flow controller from the second plant for methanation

Experimental practices with the plant to test water adsorption capacity of a designated zeolite:

Experimental work was carried out with the same plant that will be used for FT kinetic studies. Water adsorption capacity of the carrier

- Remote-controlled lab-scale reactor
- Water absorption capacity of the carrier and its behaviour under different conditions
- Hot flash and cold flash in the reactor were degassed and condensed squalane weas removed routinely (until steady state)
- Independent parameters:
- Results obtained from the tunable diode laser analyzer



Visuals from inside the reactor.

Gas Chromatography (GC) use for the analytes of a previous campaign from FT synthesis

Analytical procedure observations.

Previous chromatograms and GC methods were also shared for comparison with our methodology.

STSM main achievements

A **fruitful** STSM period with the involvement of Prof. Reinhard Rauch and his PhD and MSc students; Philipp Andreas Graefe and Fabian Eckert have been achieved.

The expected results have all been **reached** except for FT synthesis. Instead, the same plant has been used with another campaign, thus allowing the transfer of practical knowledge.

WIRE COST Action gives the opportunity to both **network and collaborate** towards future practices and standards for research and implementation in different sectors. Accordingly, some Research Coordination Objectives (RCO), Capacity-building Objectives (CBO) and Tasks outlined in the Action's Memorandum of Understanding were addressed:

STSM main achievements

RCO 2; the basis for collaboration and link the community to be brought together in the Action:

Workshop Participation

RCO 5; training to young researchers:

future collaboration for gas-fed reactors to be applied for biological purposes

CBO 1; sharing knowledge, experiences, best practices, and benchmarks:

Knowledge sharing on Design of Experiments including BBD-RSM and Taguchi OA for the current experimental campaigns.

STSM main achievements and

CBO 4; strengthening the relations between peers and institutions through short-term scientific missions:

Research visit to KIT-BLT (Institut für Bio- und Lebensmitteltechnik, Elektrobiotechnologie) on syngas fermentation

T3.1 “Comprehensive identification and survey of biorefineries products, by-products and their applications”

Experiments and the introduction of the plants and their engineering flow was also introduced.

T3.4 “Identifying research gaps and key areas where knowledge transfer shall be improved”

Knowledge tranfer and identification of technology gaps on gas stream instalments and piping

Planned follow-up activities

Integration of the gas instalments to our current lab practices

Where necessary discussions on design of experiments for further FT-synthesis campaigns

Comments and Final notes

WIRE

Experimental work

New labs

Networking

Knowledge

Culture

Contribution to the mutual goal

Thank you!

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