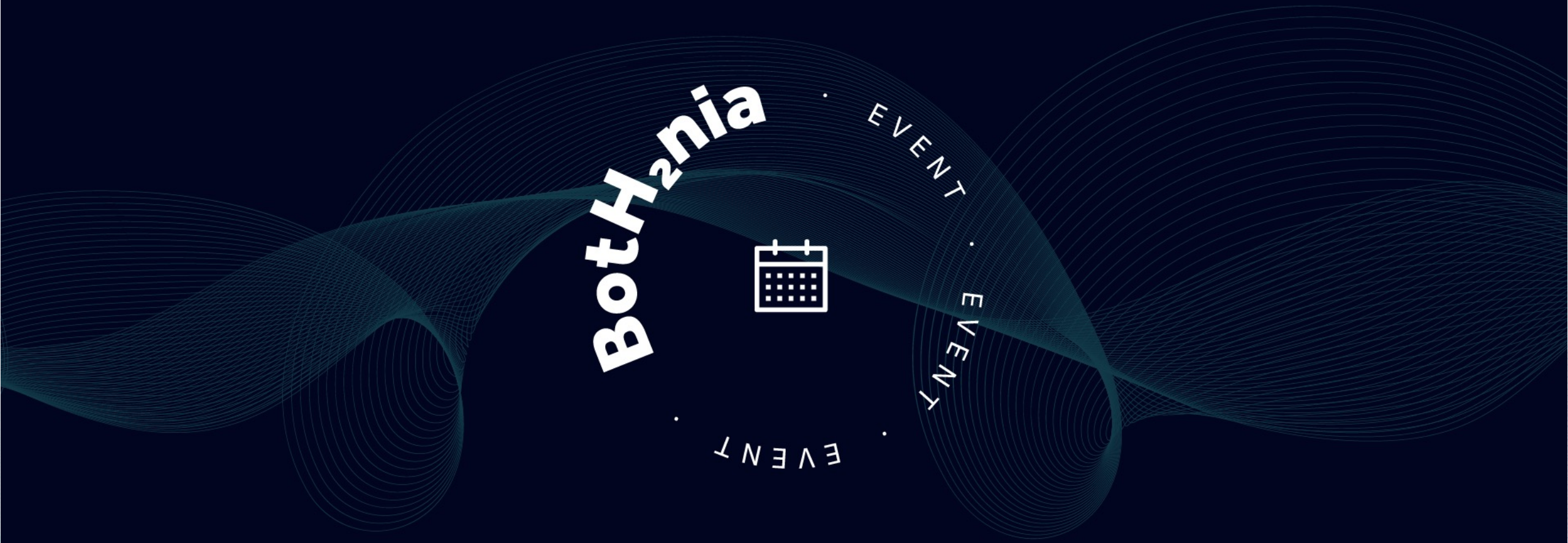
POHJOIS-POHJANMAA
COUNCIL OF OULU REGION



BotH$_2$nia goes Kokkola 16.3.2022

This is a presentation given at the event BothH_2nia goes Kokkola on 16.3.2022.

BothH_2nia is a network of operators interested in hydrogen. The objective of the network is to create a Nordic hydrogen cluster around the Baltic Sea, beginning with the Bothnian Bay. BothH_2nia strengthens the position of the north in the European hydrogen industry!

BothH_2nia invites all businesses, research institutes, investors, municipalities and cities to roll up their sleeves for a greener future.

Please notice that the presentation has been modified to comply with the Accessibility Directive. In case for need the original material, please contact Minna Näsman (minna.nasman@both2nia.com).

www.both2nia.com

HySpot

Prof. Ulla Lassi, University of Oulu

16.3.2022

Sustainable Chemistry Research Unit

Prof. Ulla Lassi, head of the Unit

FACTS (2021):

Staff: 51
3 Full professor, 5 adj. prof., 17 post docs
Degrees: 15 M.Sc., 3 Ph.D.
14 research projects (BF, AF, EU funded)
32 international publications, 2 pending patents
Close company collaboration
Disciplines in material chemistry, physical chemistry and chemical engineering

UNIVERSITY OF OULU

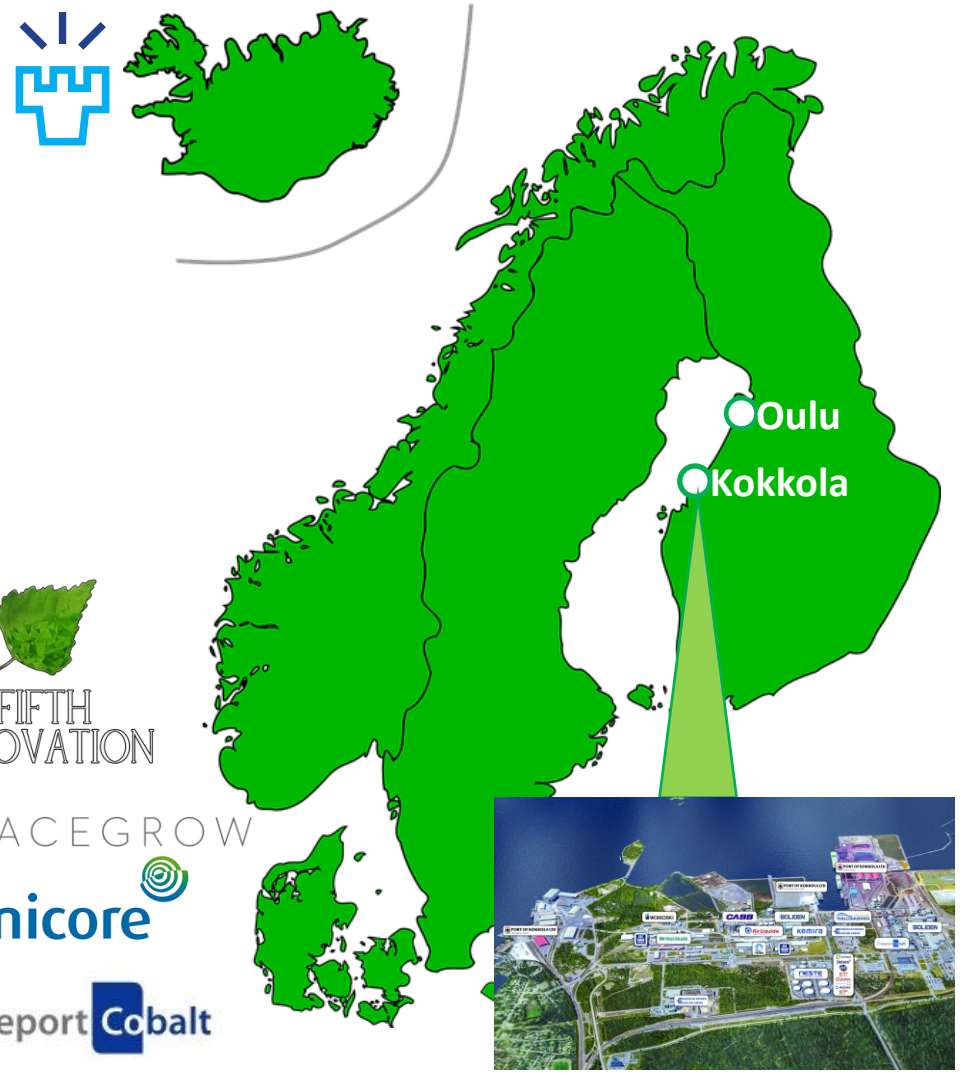
Battery chemistry research since 2007

RESEARCH FOCUS AREAS IN APPLIED CHEMISTRY (Scientific results during past years)

I. Lithium-ion battery chemicals (5 PhD, 6 PhD students, 20 M.Sc., publ.,)
Metals recovery, leaching, and co-precipitation
II. New inorganic water treatment chemicals (6 PhD, 6 PhD students, 10 M.Sc., 30 publ)
III. Inorganic catalysts in biomass conversion (5 PhD, 4 PhD students, 6 M.Sc., 15 publ.)
IV. **Carbon materials as catalysts and energy storage** (3 PhD, 3 M.Sc., 20 publ.)

www.oulu.fi/sustainablechemistry

Research Group of Applied Chemistry



Focus areas include synthesis of novel inorganic materials, such as **catalysts**, adsorbents, and **battery chemicals**

A part of the group (over 20 persons) is working at Kokkola campus

Kokkola Industrial Park (KIP), www.kip.fi, the largest hub of inorganic chemical industry in Northern Europe. Close research collaboration with the university.

www.oulu.fi/sustainablechemistry

FIFTH INNOVATION
TRACEGROW
umicore
Freeport Cobalt
BOLIDEN
KOKKOLA INDUSTRIAL PARK
KELIBER
northvolt
AKKUSER
hycamite
JYVÄSKYLÄN YLIOPISTO
KOKKOLAN YLIOPISTOKESKUS CHYDENIUS
RESEARCH UNIT OF SUSTAINABLE CHEMISTRY
Oulun yliopisto
UNIVERSITY OF OULU

Hydrogen roadmap – Sustainable chemistry

2010-2015

FT synthesis
Conversion of biomass-derived synthesis gas to olefins/FT diesel

Collaboration with LTU & NTNU

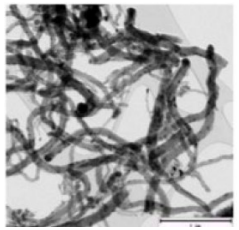
2015-2021

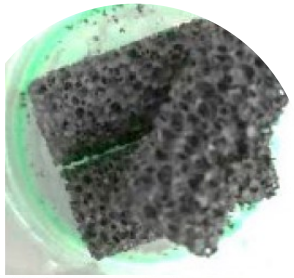
Methane pyrolysis to hydrogen and carbon

Carbon applications (activated carbon, carbon foams, carbon catalysis)

Carbon use in batteries

Hydrogen reduction (with MET)

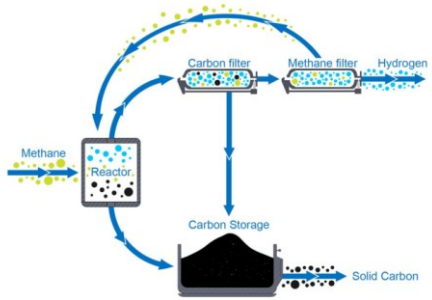




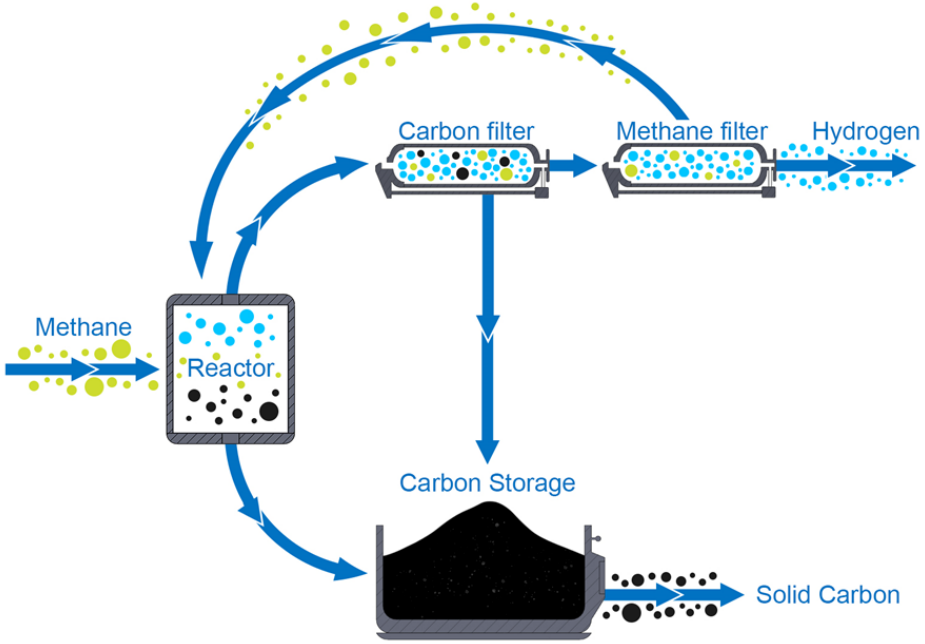
2022-

Improved material efficiency for **methane pyrolysis** (use of secondary materials)

Hydrogen reduction in metallurgical industry (with MET)



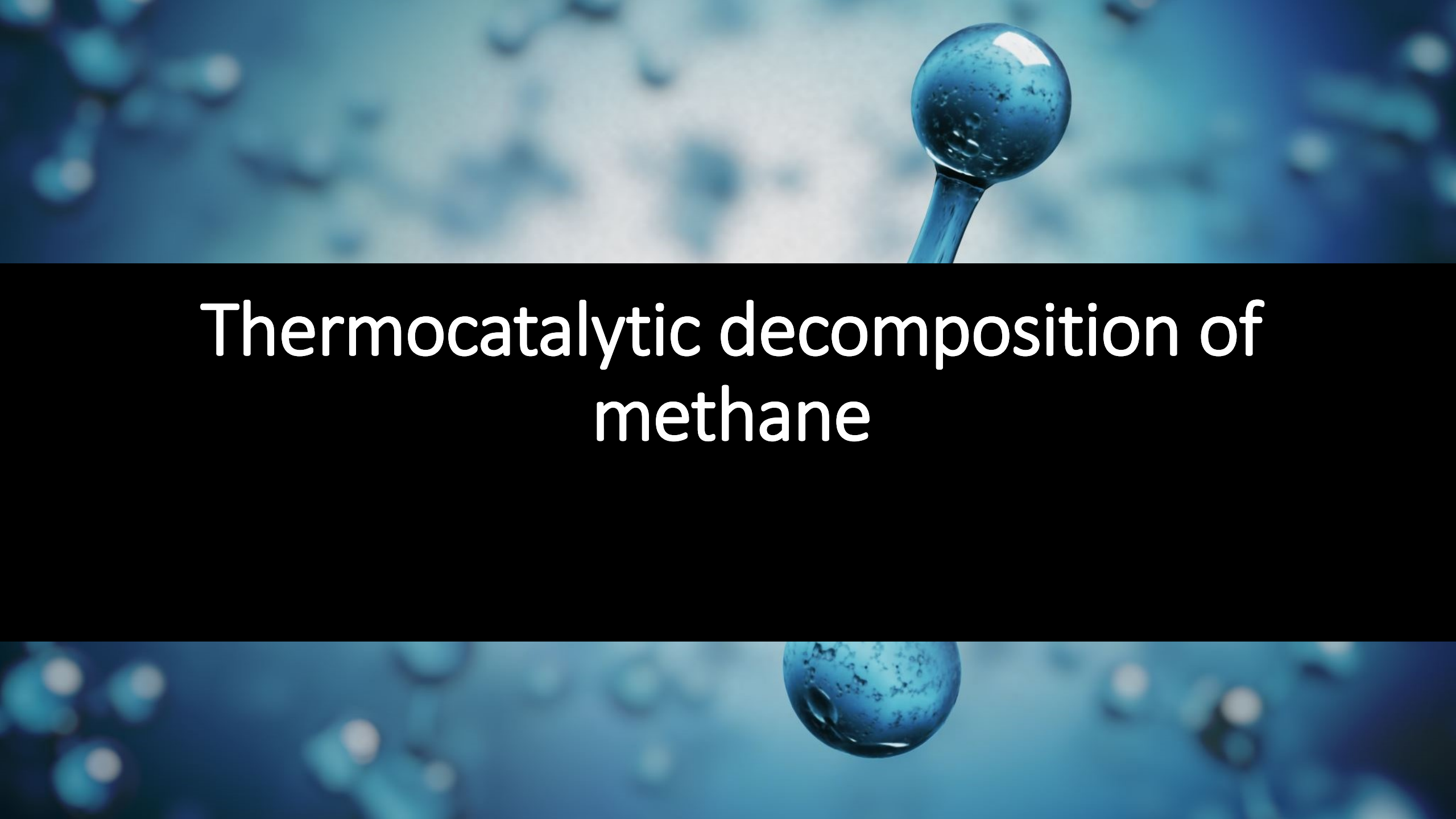
HySpot- Production of hydrogen and solid carbon



$CH_4 \rightarrow 2\ H_2 + C$

- Several innovations behind this:

1) Use of CO_2/CO free technology
2) Catalyst
3) Reactor set-up
4) Solid carbon for energy storage applications



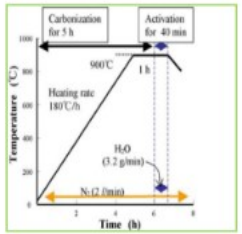
Thermocatalytic decomposition of methane

TCD reactor

Technical carbons for different applications

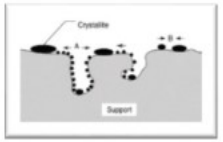
Biomass
- Sawdust
- Lignin

Carbonization and activation



Activated carbon
- High value technical carbons

Surface modification



Active metal impregnation

Me/C catalyst

Sustainable Carbon as a secondary product supplementing the sales

PRODUCTS

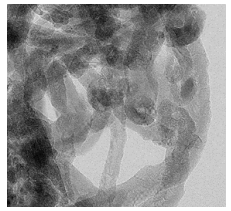
Carbon nanotubes (CNT)

Carbon nanofibers (CNF)

Amorphous carbon → activated carbon

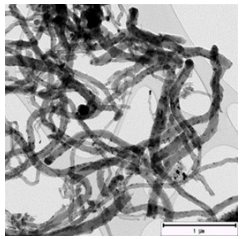
Graphite

Graphite



- Battery industry
- Lightweight materials for automotive and aerospace industry

CNT, CNF



- Battery industry
- Electric vehicles (supercapacitors)
- Catalysts

Activated carbon

- Water treatment
- Pharmaceutical purification
- Industrial applications

hycamite

Conclusions

- Methane pyrolysis opens up CO_2/CO free method for hydrogen production
- Catalyst lowers reaction temperatures and affects the carbon quality
- Captured carbon has high potential in several applications

Thanks for your attention!

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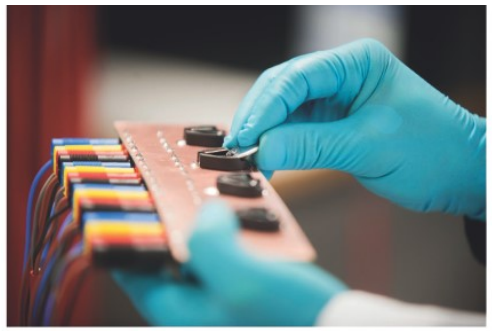
Kokkola University Consortium Chydenius
sposti: ulla.lassi@oulu.fi,
puh: +358 400 294 090

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Battery chemistry research since 2007