

Reliable Bio-based Refinery Intermediates – BioMates



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Agenda

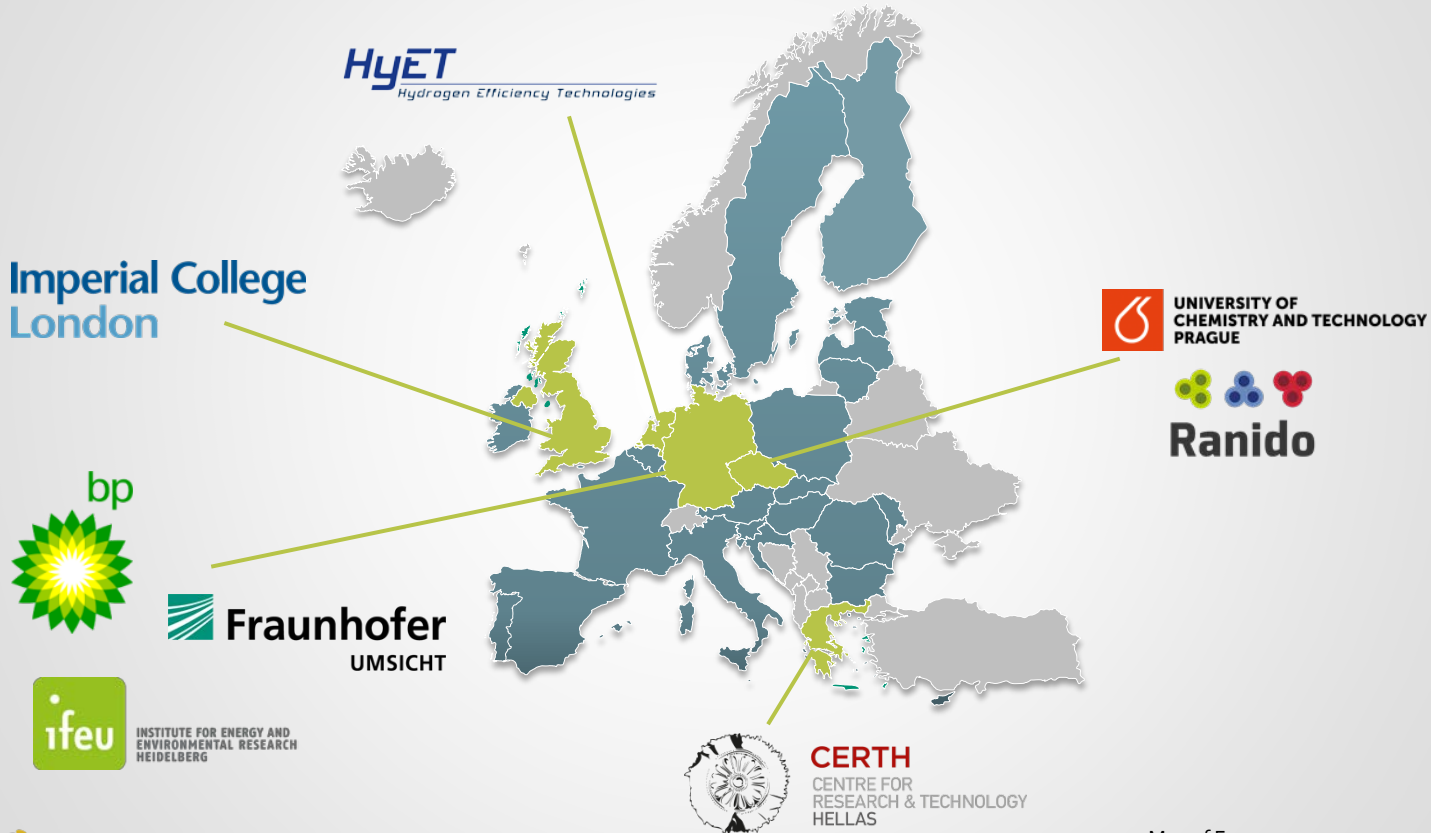
- The project + the partners
- The process principle
- The process steps
 - ⇒ Ablative fast pyrolysis
 - ⇒ Mild hydrotreatment
 - ⇒ Electrochemical H₂-compression
- Ensuring applicability
- First results
- Thanks, disclaimer
- Take-home-messages

The Project

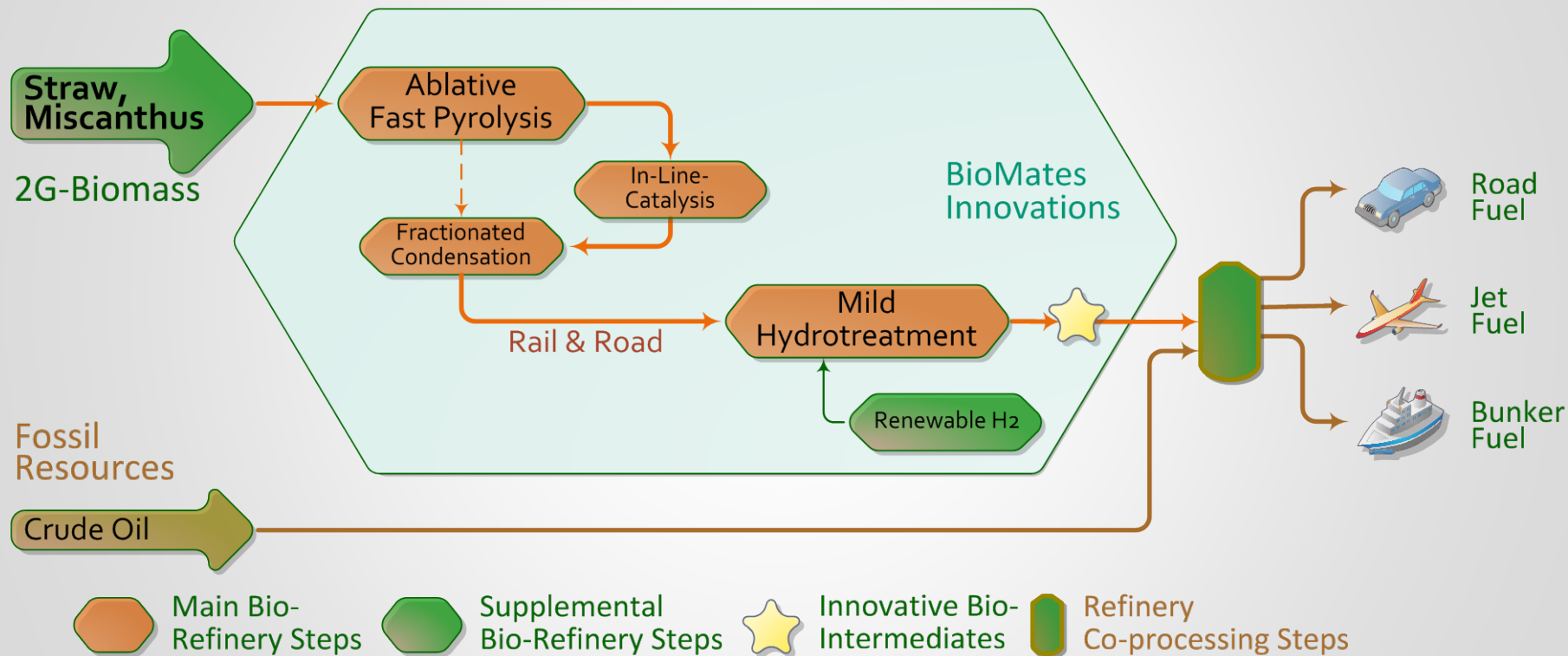
- Horizon 2020 – 727463
- Reliable Bio-based Refinery Intermediates - BioMates
- 10.2016 - 09.2020
- www.biomates.eu



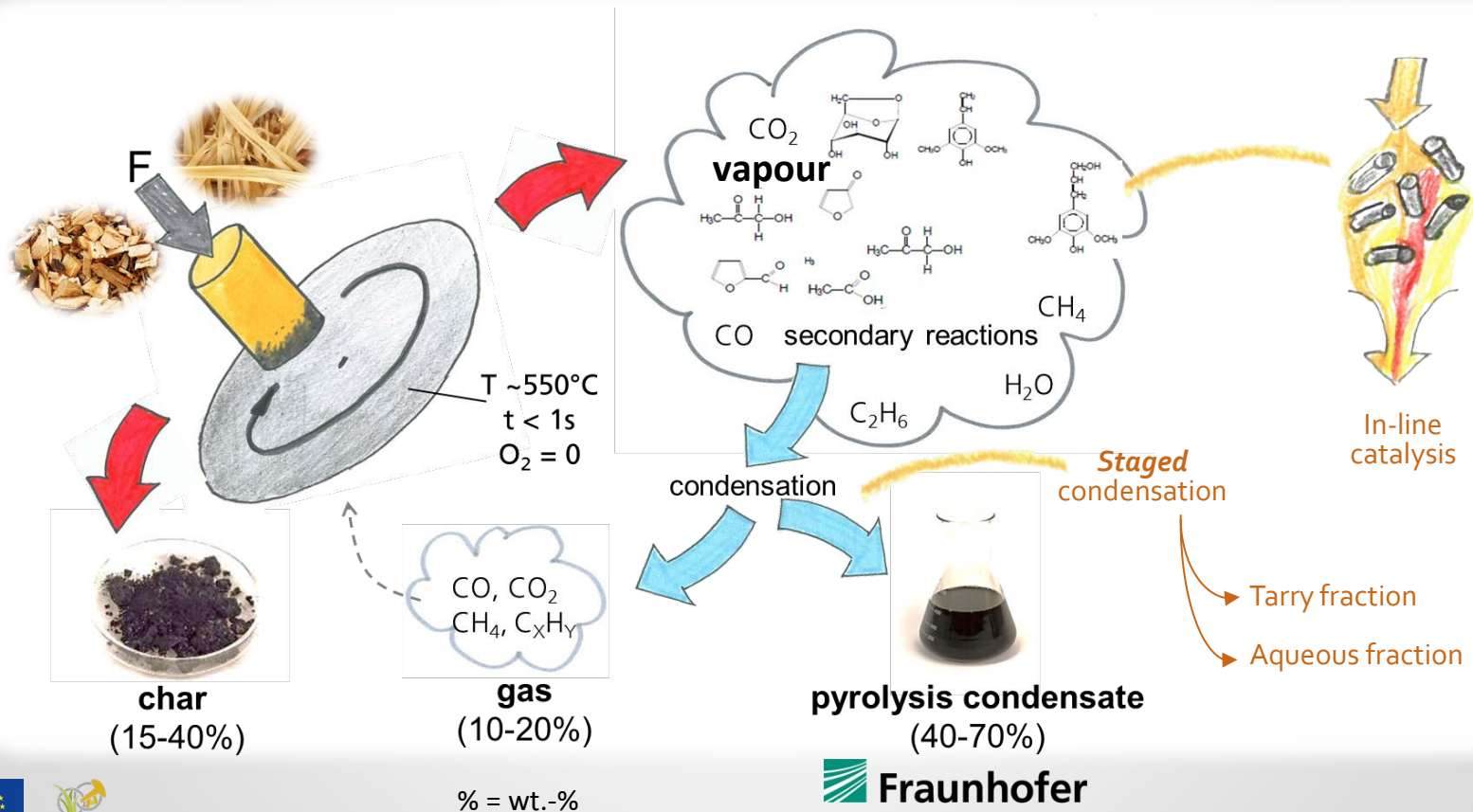
The Partners



The Process Principle



Step 1: Ablative Fast Pyrolysis



Step 1: Ablative Fast Pyrolysis

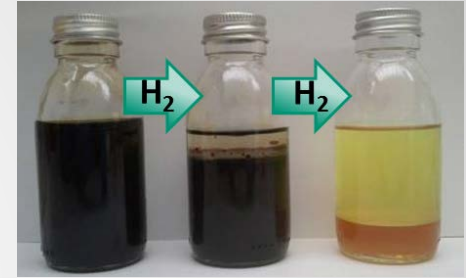
Detail step	Temperature (app.) \Rightarrow	\Rightarrow ideal for:
Fast pyrolysis	550 °C	Condensate formation
In-line catalysis	400 - 500 °C	Removing oxygen-containing functional groups ¹
Staged condensation, step 1	60 - 90 °C	Water-free tarry fraction
Staged condensation, step 2	4 °C	Complete aqueous fraction recovery

¹ experiences from similar processes

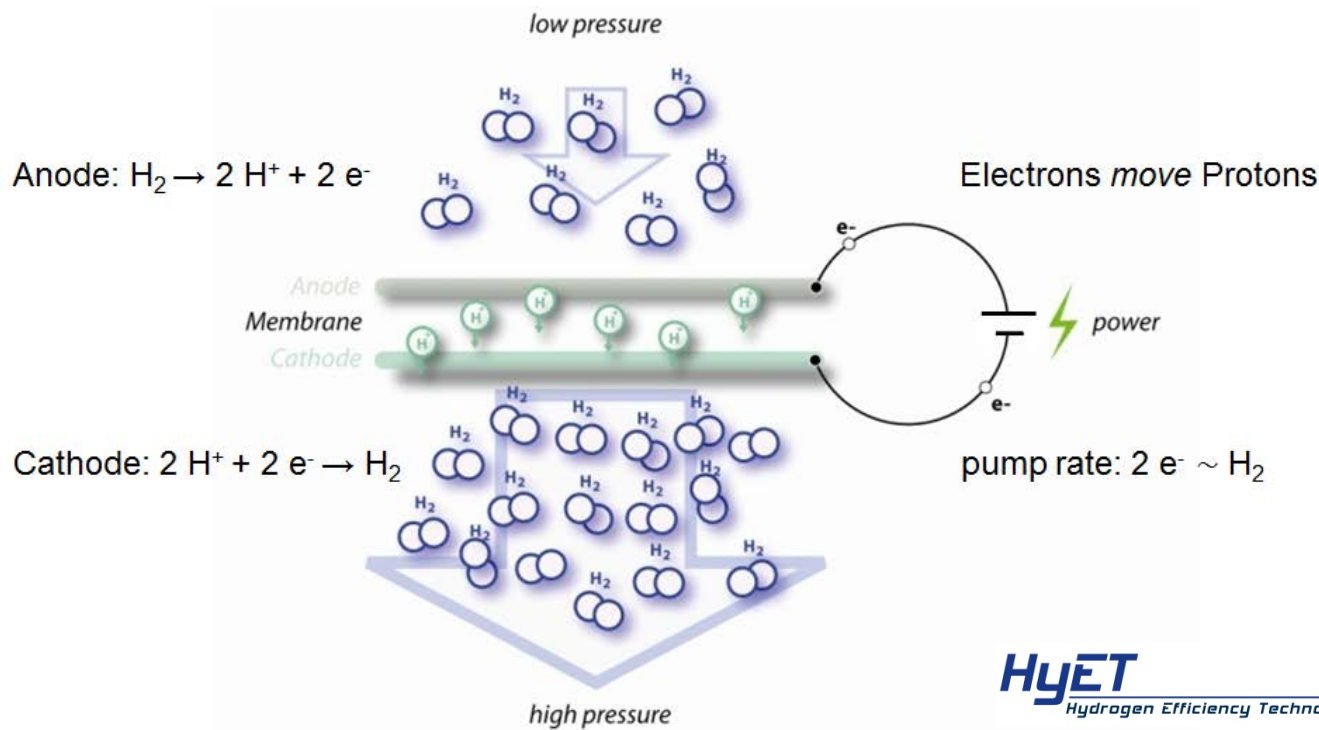


Step 2: Mild Hydrotreatment

- Conversion of bio-oil into a refinery feed
- Ensures **reliable properties** of the intermediate
- Optimum hydrogen consumption
 - ⇒ as much as needed, as little as possible
 - ⇒ tailor-made catalysts
- Innovative hydrogen management
 - ⇒ solar-power produced
 - ⇒ electrochemical compression and purification
 - ⇒ refinery integration



Step 3: Electrochemical H₂-Compression



HyET
Hydrogen Efficiency Technologies

Ensuring Applicability 1

- Technical Application of BioMates
 - ⇒ Profile of Properties
 - ⇒ Entry-points into the Refinery
 - ⇒ Test Runs in a pilot-scale Refinery



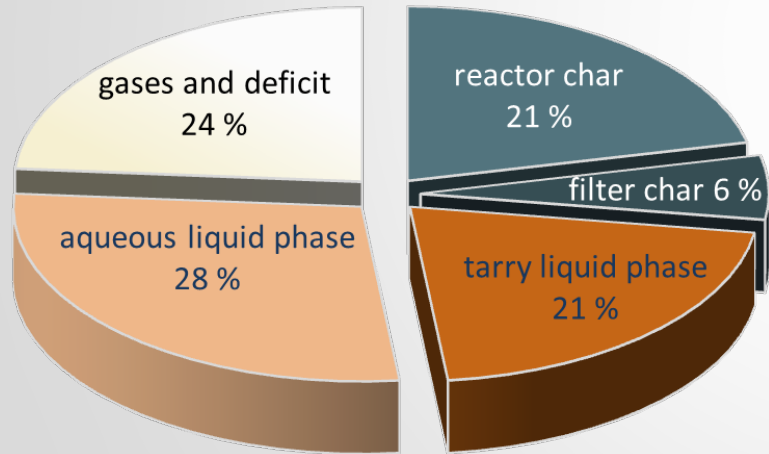
Ensuring Applicability 2

- Sustainability, Social Compatibility, Economic Feasibility
 - ⇒ Environmental assessment, economic assessment
 - ⇒ Social, policy and health assessment
 - ⇒ Integrated sustainability assessment
- Feedback-loops in process development
- Stakeholder workshop
- Political recommendations
- Developing business-plans

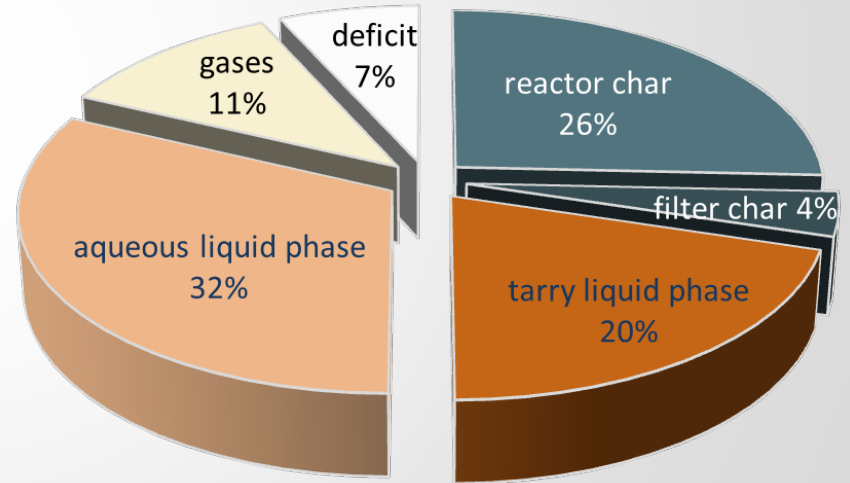
1st results: Ablative Fast Pyrolysis

Scale: 4.5 kg/h feed,
complete condensation

Straw (50 % wheat, 50 % barley)

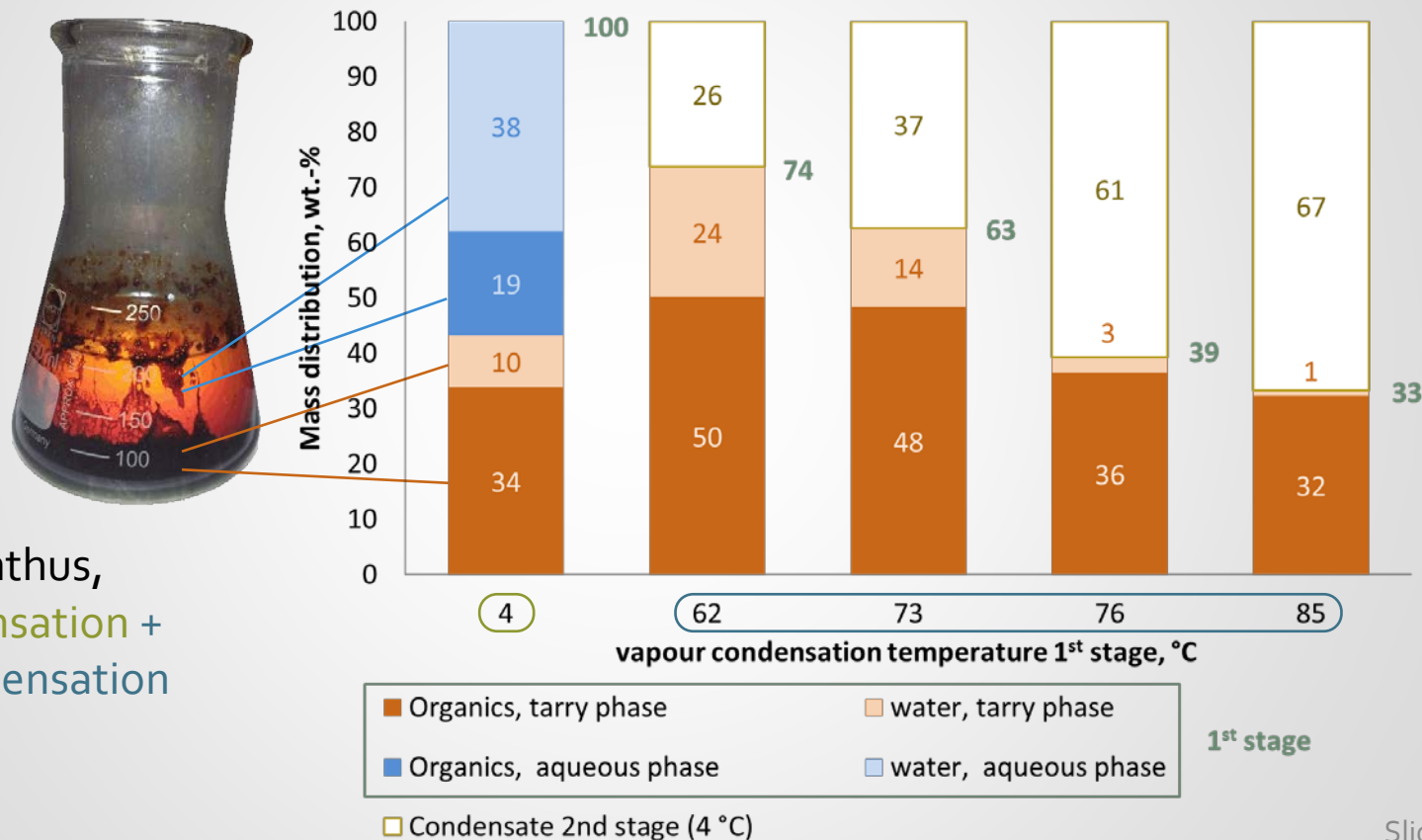


Miscanthus



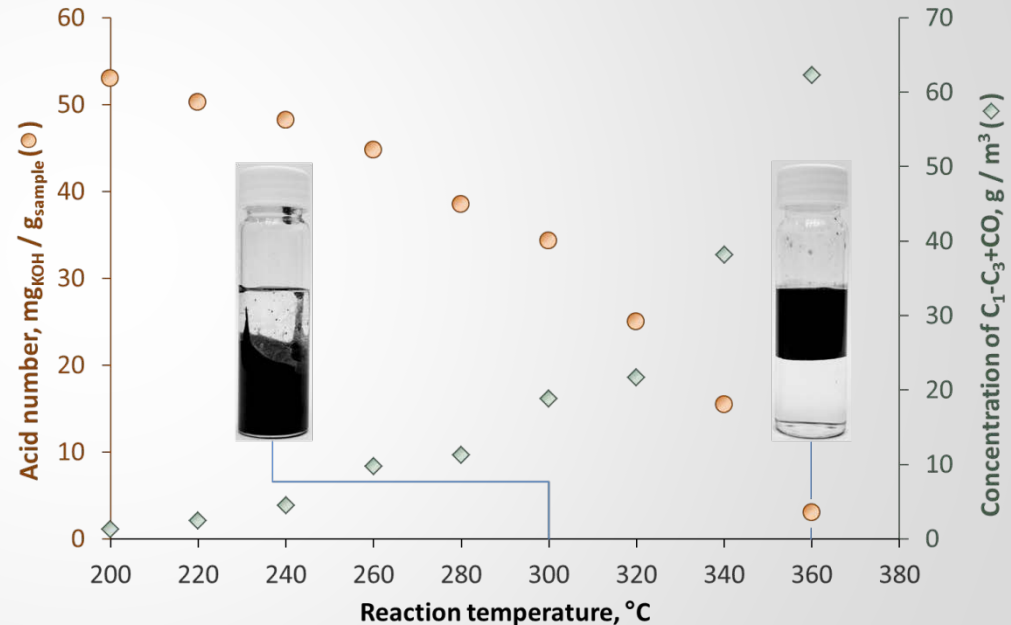
1st results: Ablative Fast Pyrolysis

AFP-run
from miscanthus,
total condensation +
staged condensation



1st results: Mild Hydrotreatment

- Straw-derived tarry phase, complete condensation
- Increasing M-HDT-temperature:
 - ↓ Acid number (I)
 - ↑ c (C₁-Components) (g)
 - ↓ Density (I)
 - ⇒ Enhancing properties means loss of energy content
 - ⇒ A typical optimisation task!



Thanks, Disclaimer

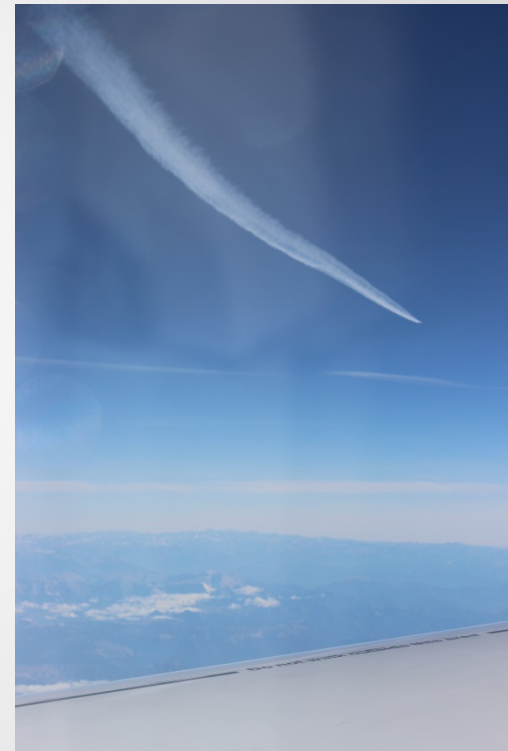
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Take-home-messages

- BioMates develops co-feeds for conventional refineries
 - ⇒ from 2G-Biomass (Straw, Miscanthus)
 - ⇒ with reliable properties
 - ⇒ via ablative flash pyrolysis + mild hydrotreatment
- Ablative flash pyrolysis will be improved by
 - ⇒ staged condensation
 - ⇒ in-line-catalysis
- Mild hydrotreatment
 - ⇒ is able to improve bio-oil quality



Thank you very much for your attention!



Questions?



Contact

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