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Upgrading of Fast Pyrolysis Byproducts for Material Use with High Value

A. Funke

Institute of Catalysis Research and Technology (IKFT)

M.M. Abbas

Institute of Catalysis Research and Technology (IKFT)

N. Dahmen

Institute of Catalysis Research and Technology (IKFT)

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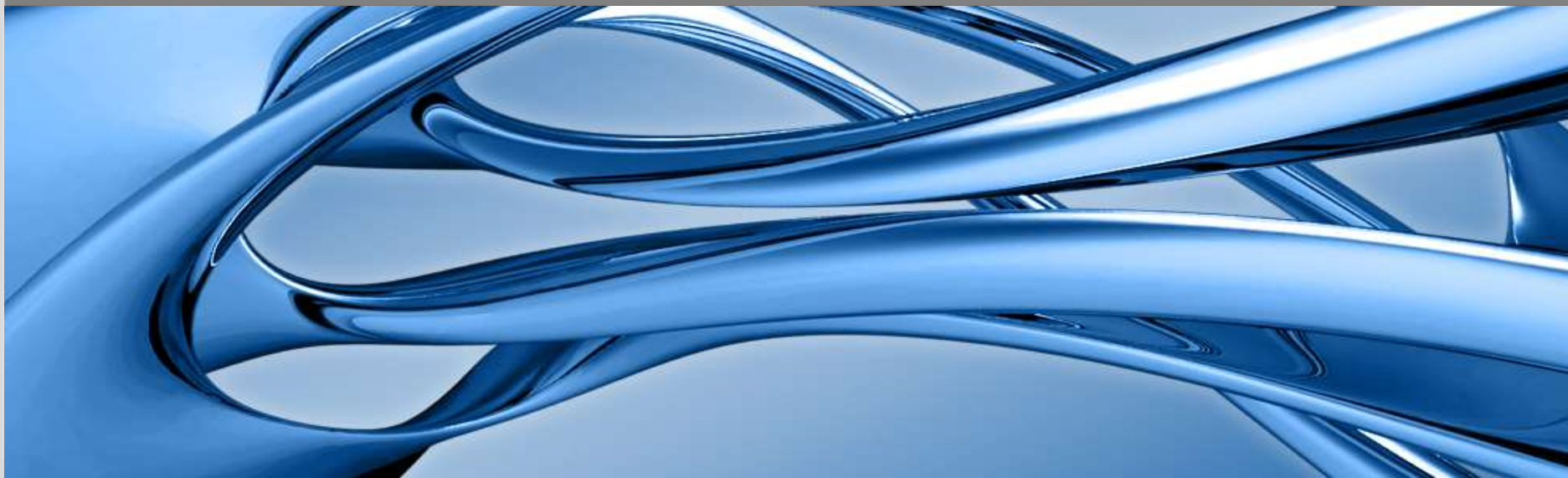
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Upgrading of Fast Pyrolysis Byproducts for Material Use with High Value

A. Funke; M. M. Abbas, N. Dahmen

INSTITUTE OF CATALYSIS RESEARCH AND TECHNOLOGY (IKFT)



Outline

- Rationale of using char from fast pyrolysis
 - Example bioliq

- Activation and demineralization of fast pyrolysis char

Fast pyrolysis bio-oil

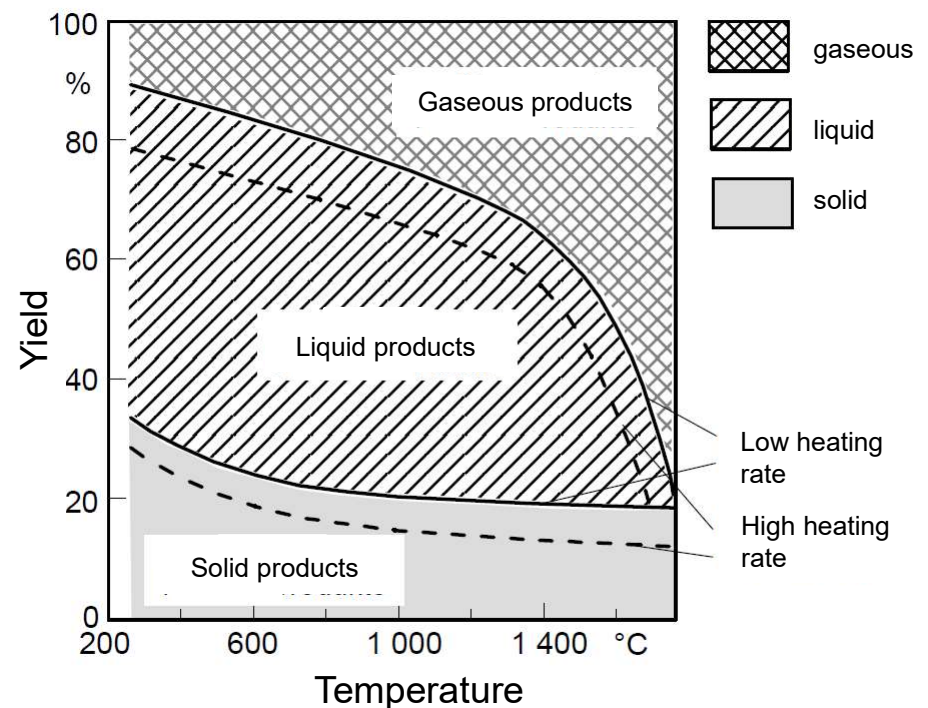
- Moderate temperature and high heating rate (wood):

- 60-70 % liquid organics
- <10 % char

- Char represents byproduct of low quantity

- Current use

- Oxidation to provide process heat
- Surplus heat & power as optional products

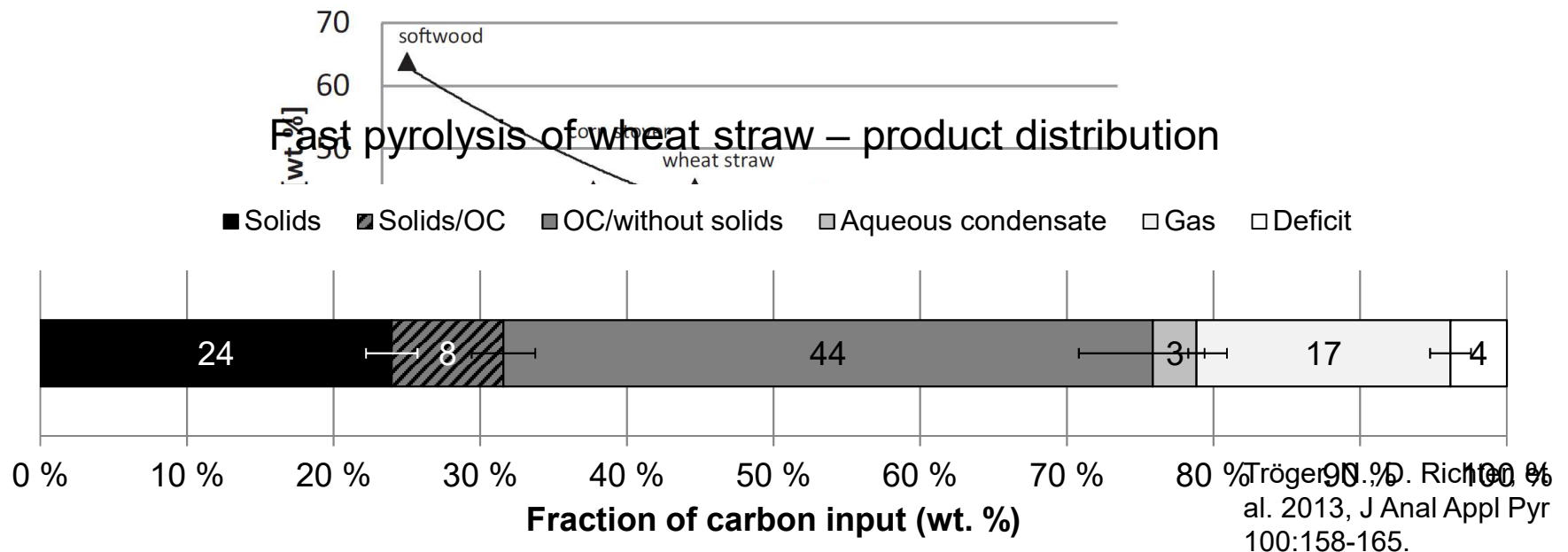


Adapted from:

Hofbauer, H., M. Kaltschmitt, et al. (2009). Energie aus Biomasse - Grundlagen, Techniken, Verfahren. Springer Verlag, Berlin Heidelberg.

Ash-containing feedstock

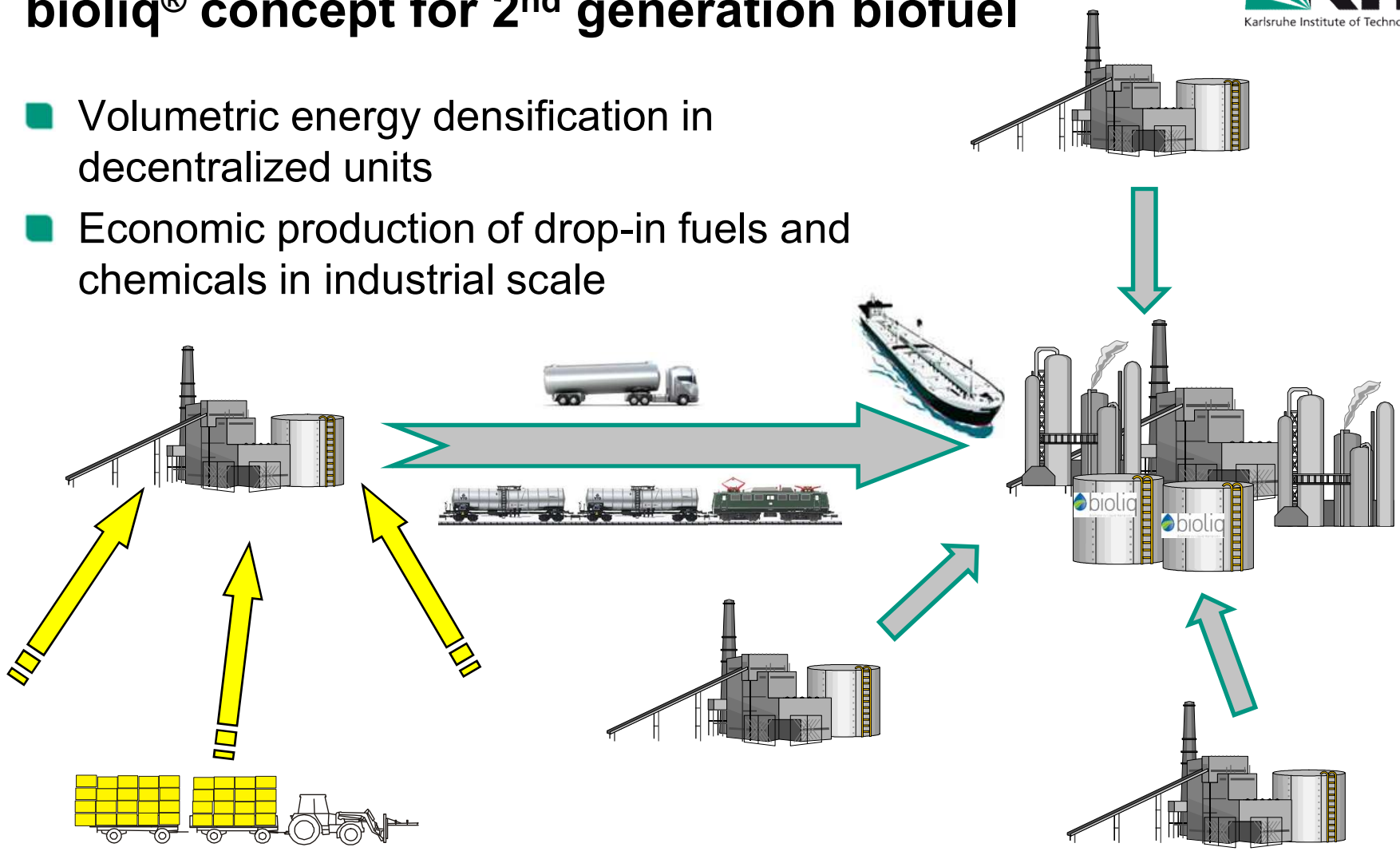
Fast pyrolysis of wheat straw – product distribution



- Ash increases the yield of (organic) solids
 - Solids contain significant fraction of carbon
 - Use of char becomes more attractive

bioliq[®] concept for 2nd generation biofuel

- Volumetric energy densification in decentralized units
- Economic production of drop-in fuels and chemicals in industrial scale



Energy density: 2 GJ/m³

25 GJ/m³

36 GJ/m³

Pilot plant and research platform



Gefördert durch:



Bundesministerium
für Ernährung
und Landwirtschaft

Commercial

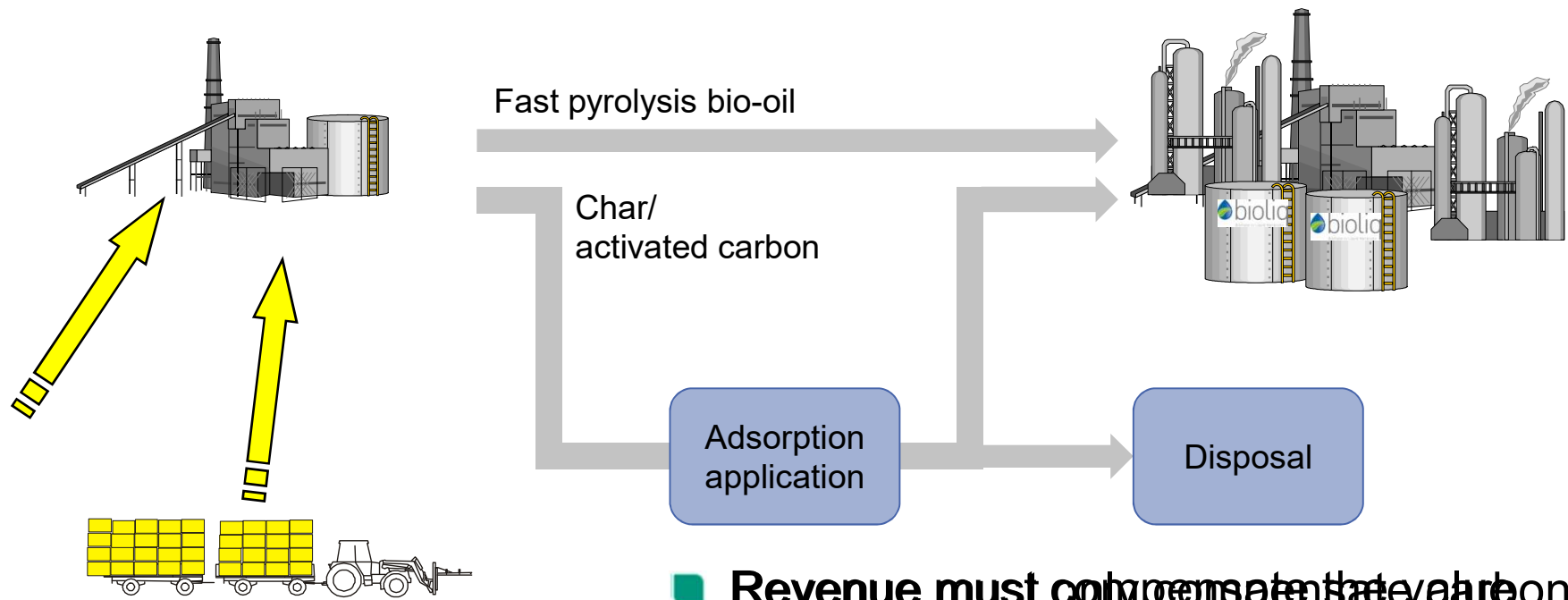
aufgrund eines Beschlusses
des Deutschen Bundestages



Fachagentur Nachwachsende Rohstoffe e.V.

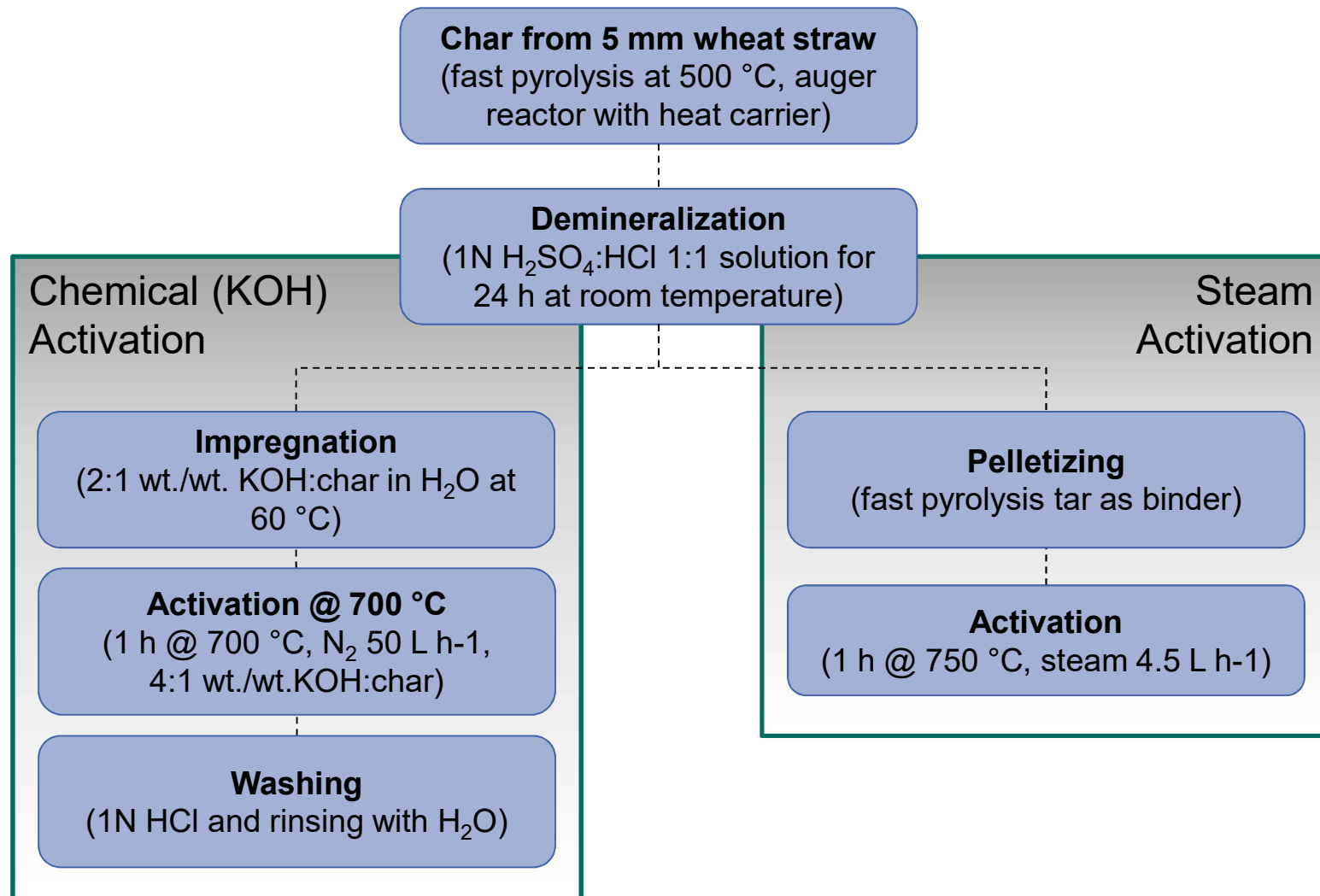


Cascaded approach

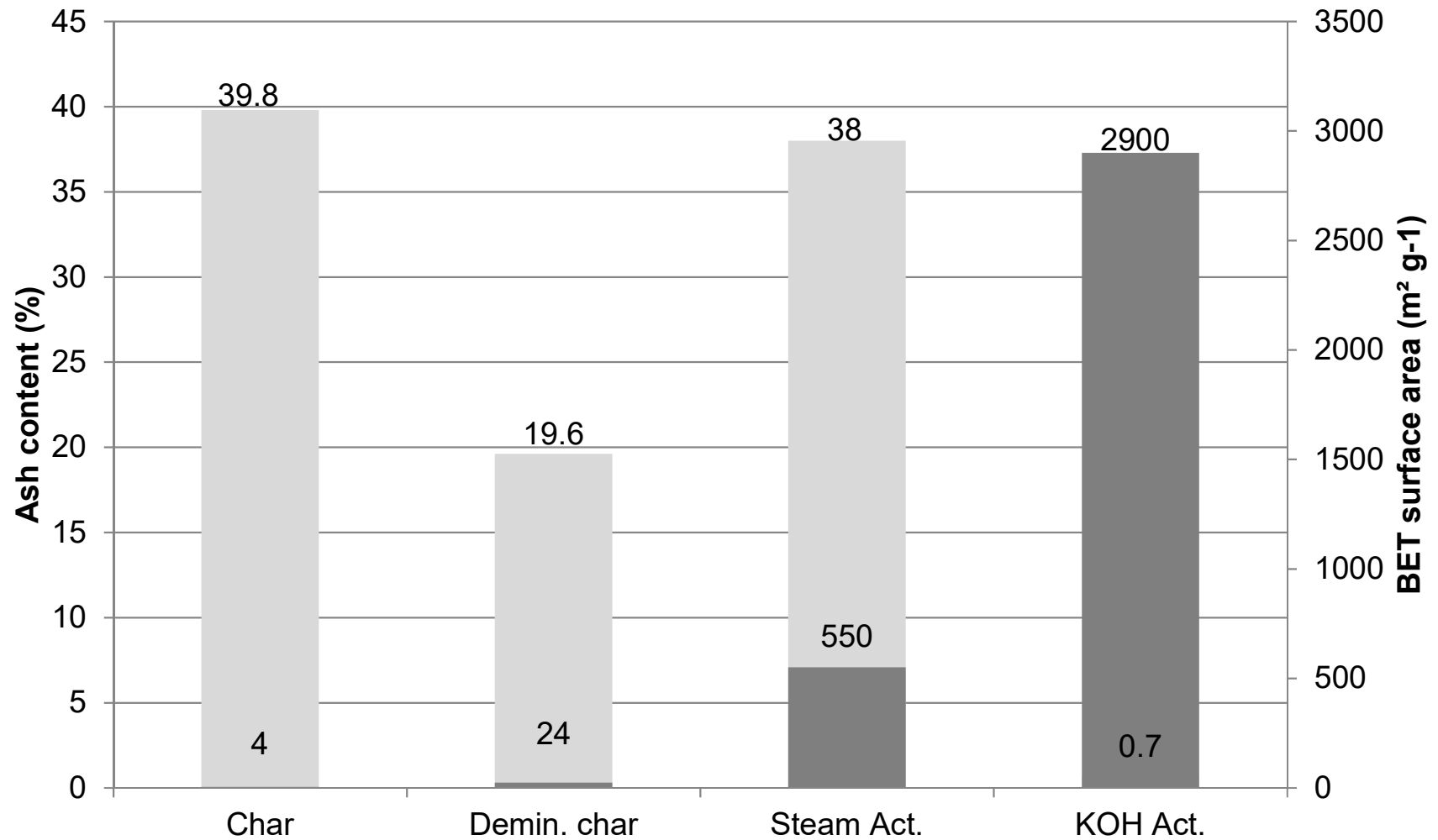


- Revenue must only compensate the carbon addition from producing (bio)fuel
- Resilient effects on gasifier design
 - No water gas shift required
 - No solids, less ash

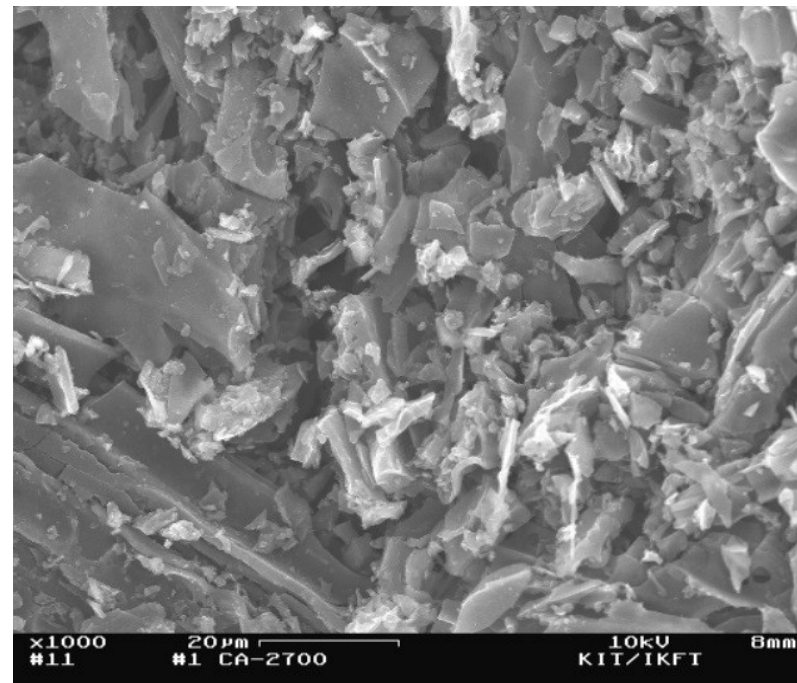
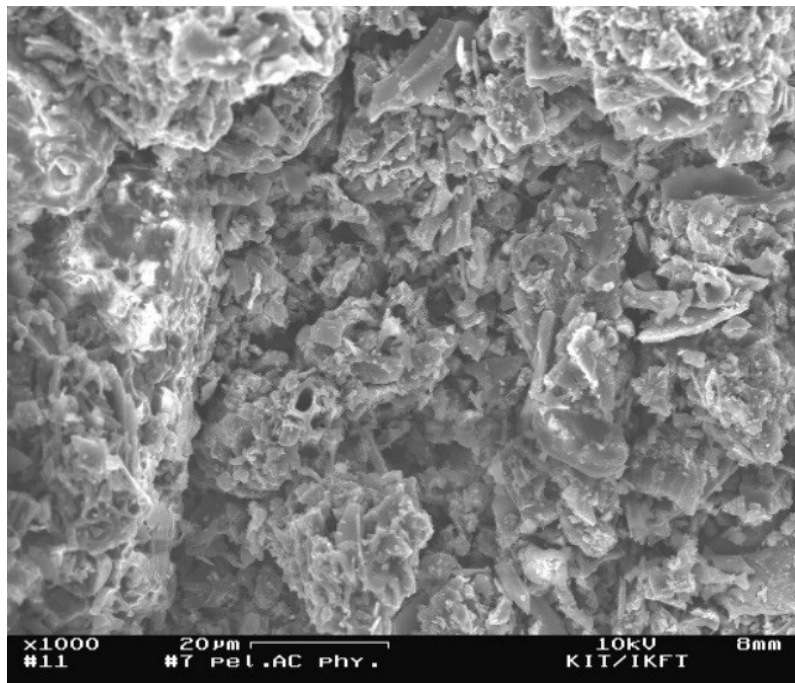
Activation procedures



Results of different activation methods

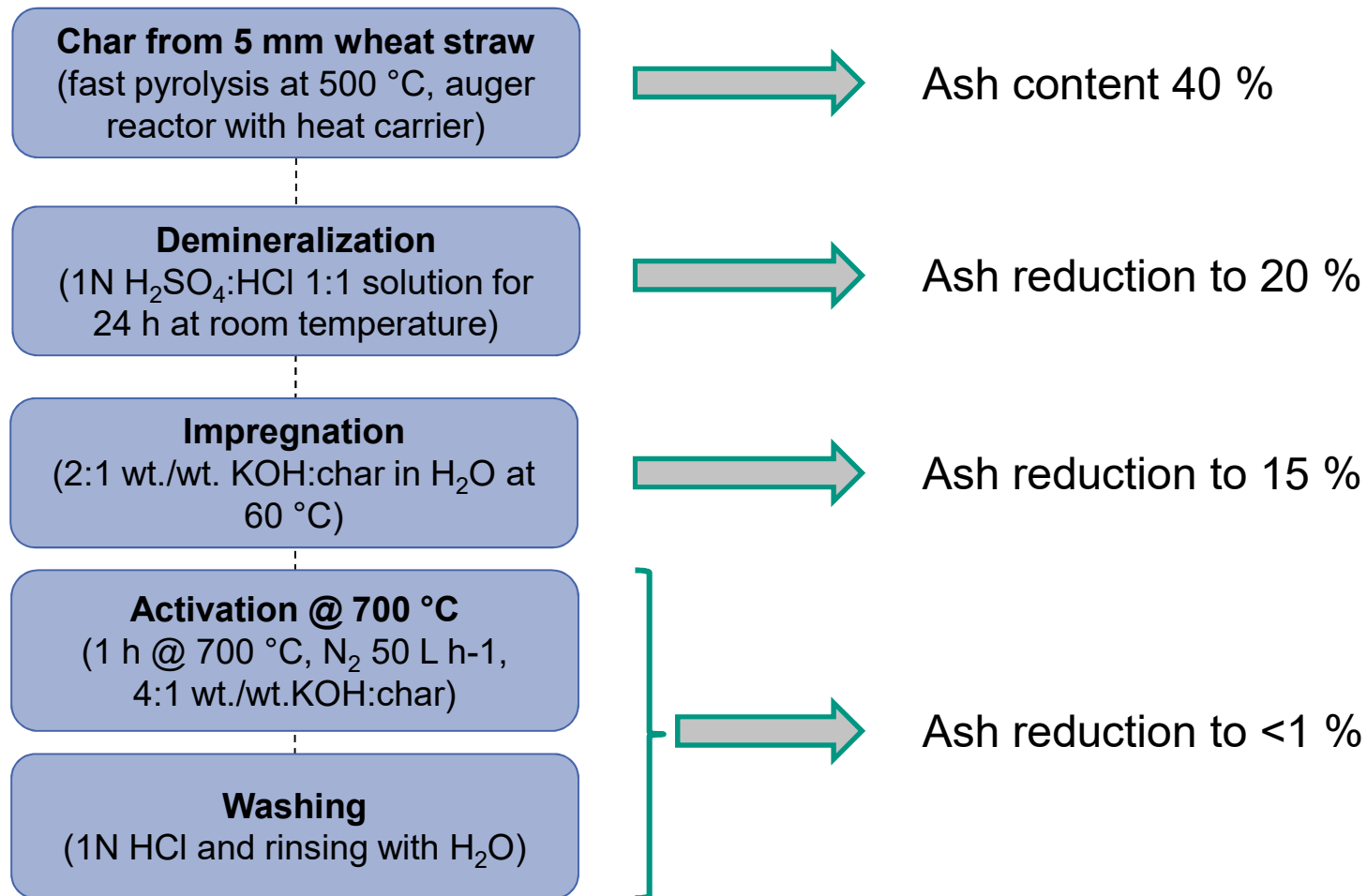


Characterization of activated carbon

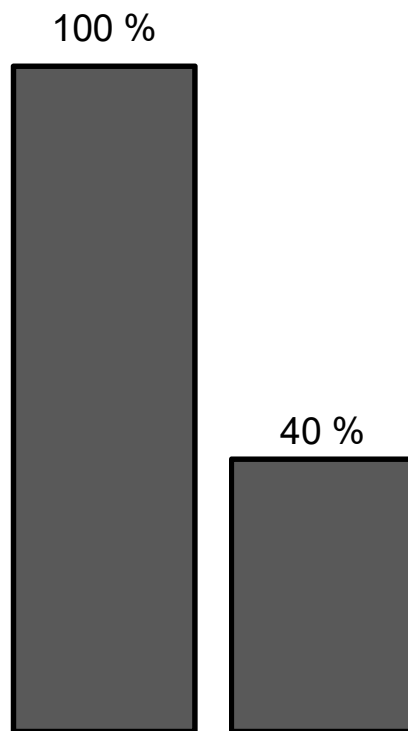


- Steam activation: mesopores
- Chemical activation: micropores

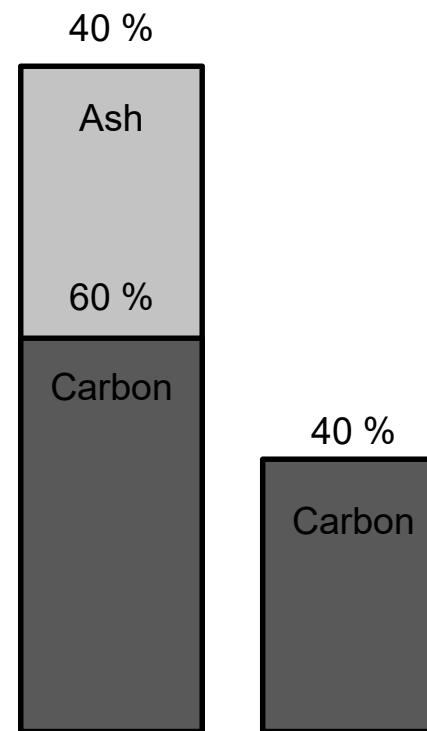
Simplifying activation method



Activation burn off



Mass loss due to activation



Mass loss due to activation considering ash content

■ Carbon losses due to activation are <40 %

Summary

- Fast pyrolysis char is a significant byproduct if feedstocks with high ash content are used
- It was shown that combined activation and demineralization of fast pyrolysis char is possible

Thank you for your attention!

And many thanks to:

Willy Habicht

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Elisabeth Schröder

Patrick Wenke

Dr.-Ing. Axel Funke

Karlsruhe Institute of Technology (KIT)
Institute of Catalysis Research and Technology (IKFT)

Phone: +49 721 608-**22391**

Email: axel.funke@kit.edu

Web: <http://www.kit.edu/>