Catalytic low temperature conversion of hydrocarbon containing feedstocks

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Outline

- Motivation
- Experimental set up
- Results
- Modeling
- Summary

Motivation

Risk of renewables and plastic waste as a feedstocks for chemicals

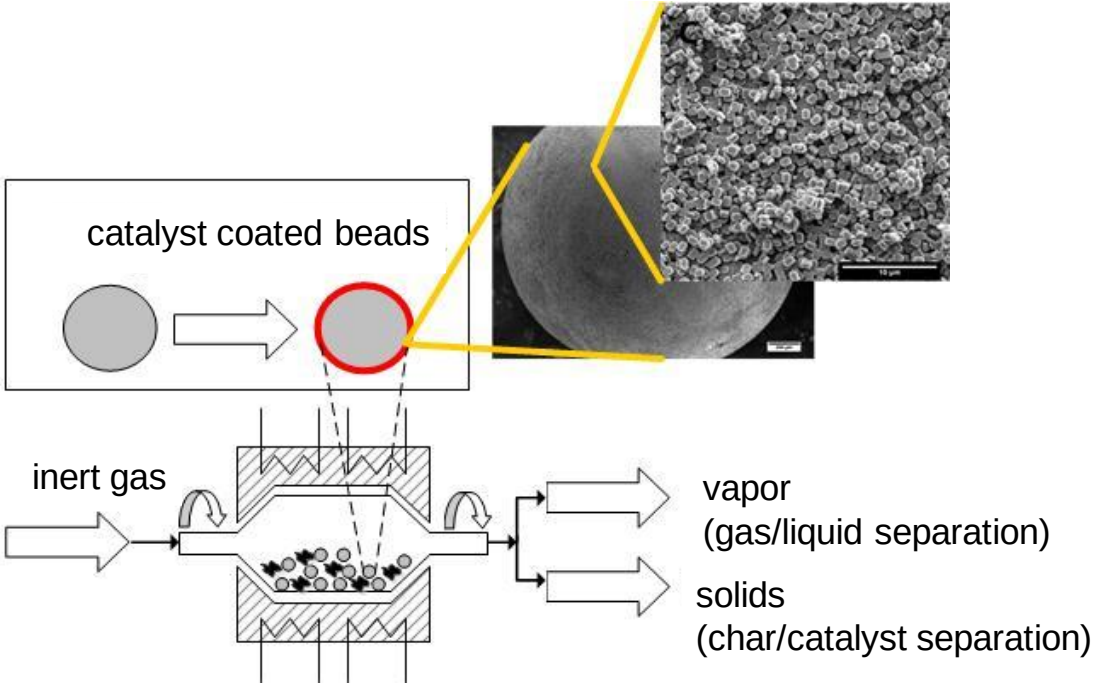
- availability
- price

New technologies have to be suited to convert different feedstocks and should be able to use also fossil resources

Problem: amount and quality of the products has to be the same

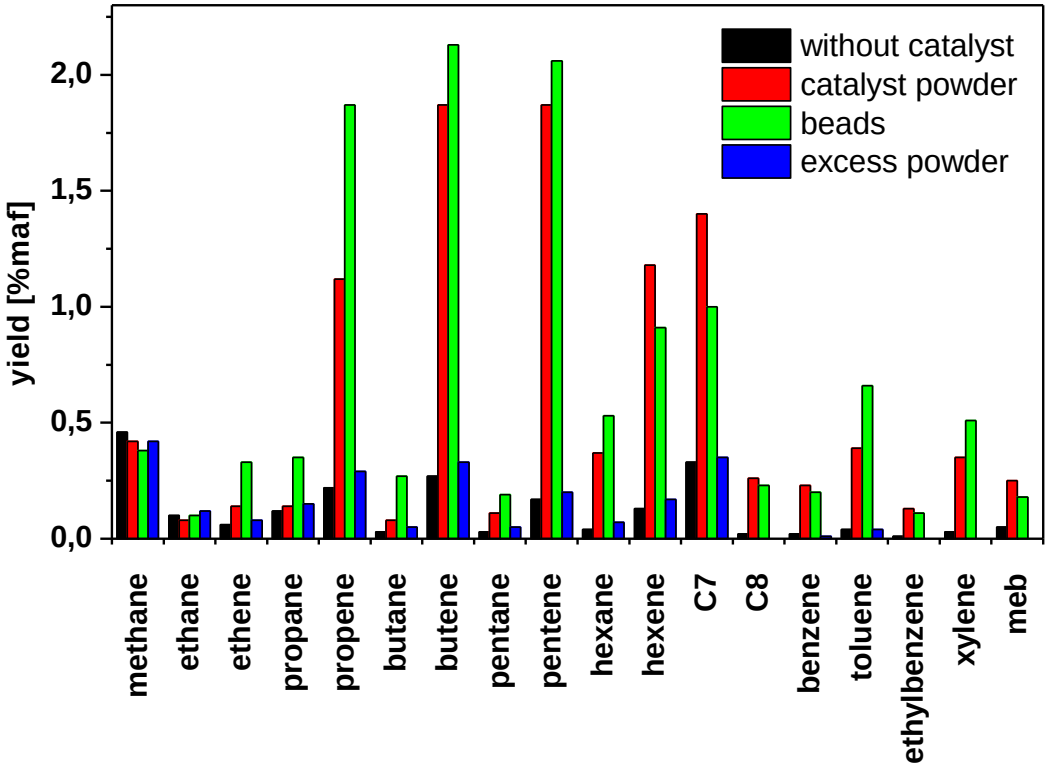
➔ Modelling of the process

Experimental set up



Results

Conditions:
Batch:,
T = 400° C,
τ = 100 s ,
coal(maf) /catalyst
ratio = 20 : 1
H/C lignite = 1.0
catalyst = MFI



Results

Conditions:
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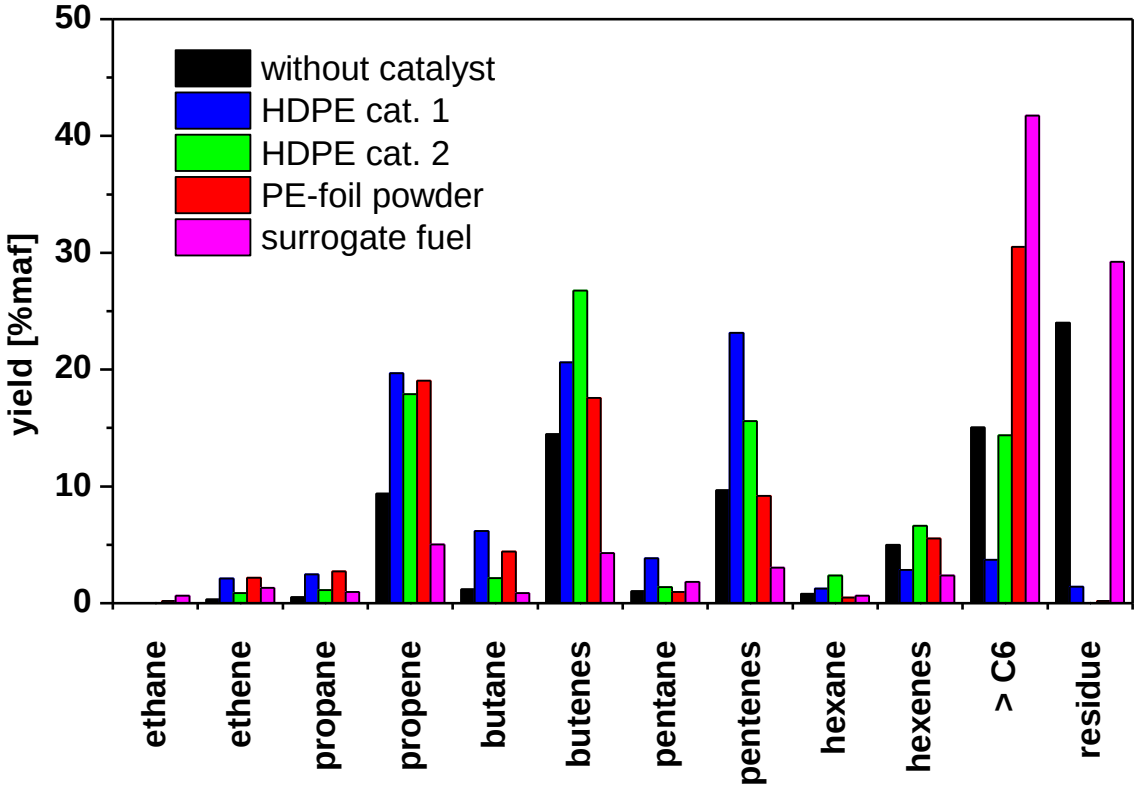
T = 400° C,
τ = 100 s ,
x/catalyst ratio
= 20 : 1
MFI



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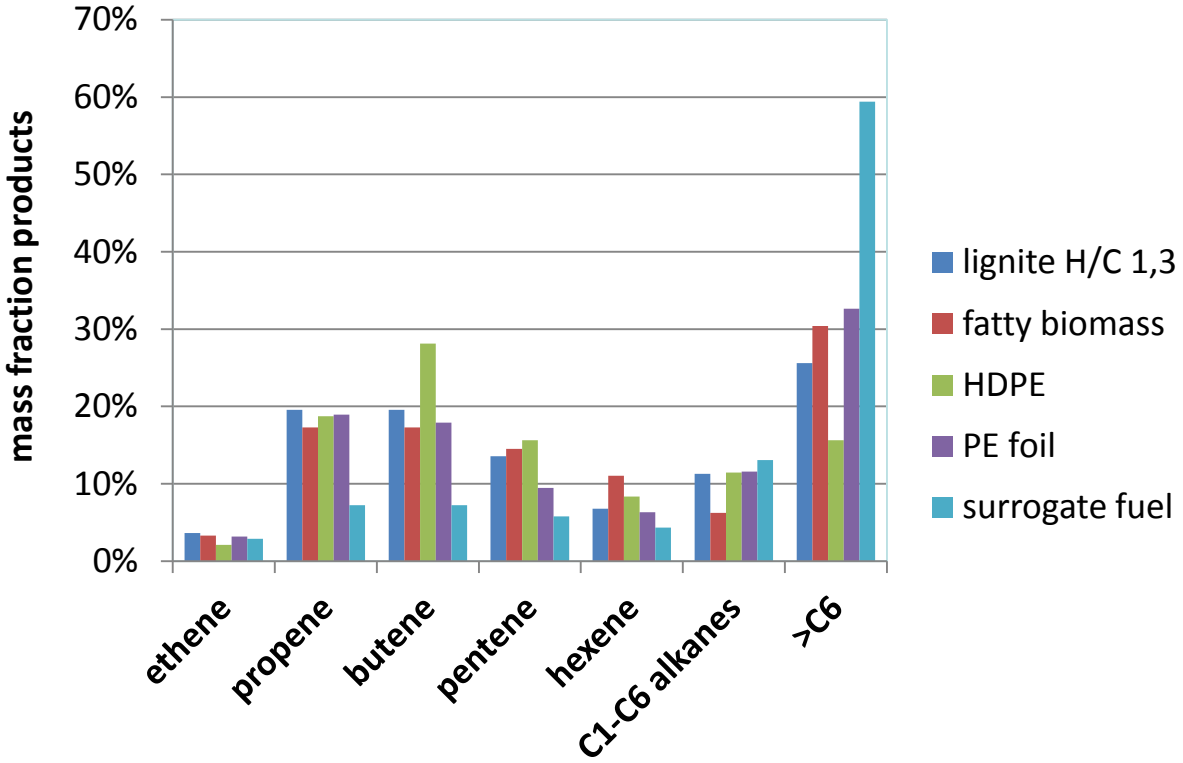
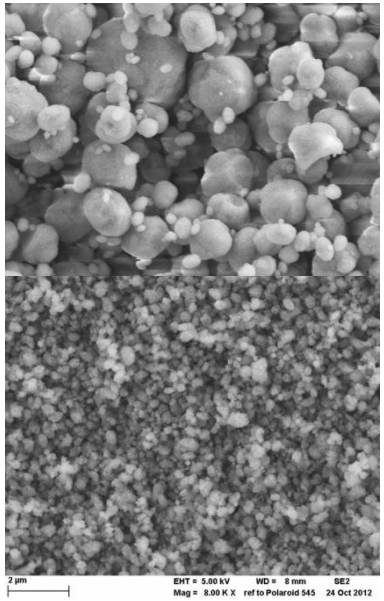
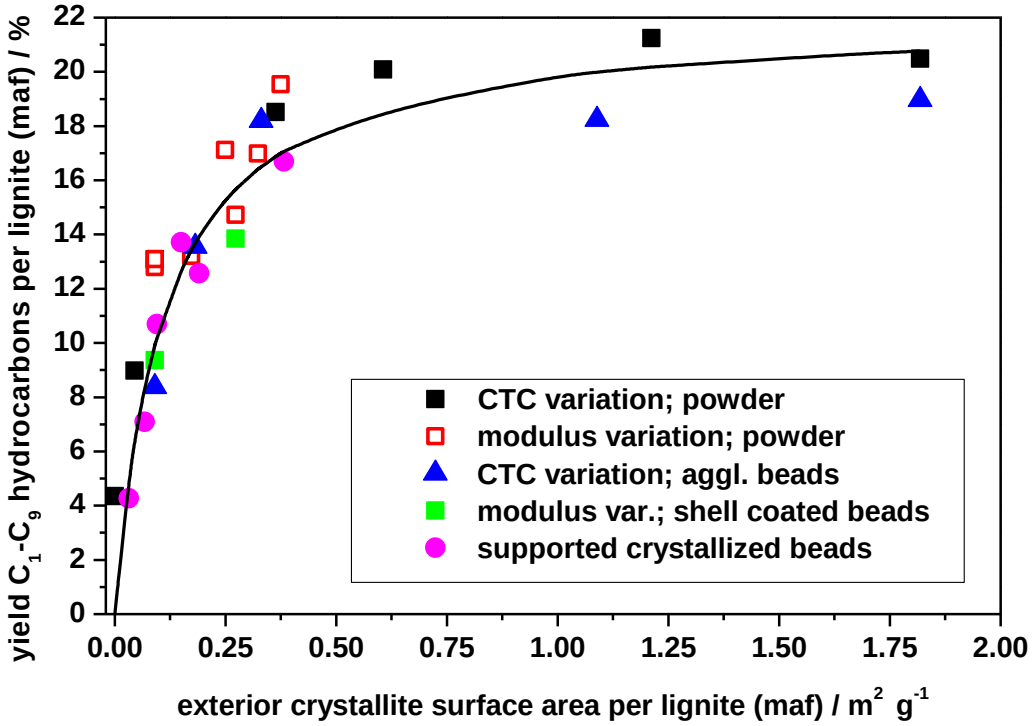


Modeling


2 µm
EHT = 5.00 kV
WD = 8 mm
SE2
Mag = 8.00 K X
ref to Polaroid 545
24 Oct 2012


yield C_1-C_9 hydrocarbons per lignite (maf) / %
exterior crystallite surface area per lignite (maf) / m^2 g^{-1}
0
2
4
6
8
10
12
14
16
18
20
22
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
CTC variation; powder
modulus variation; powder
CTC variation; aggl. beads
modulus var.; shell coated beads
supported crystallized beads

Modeling

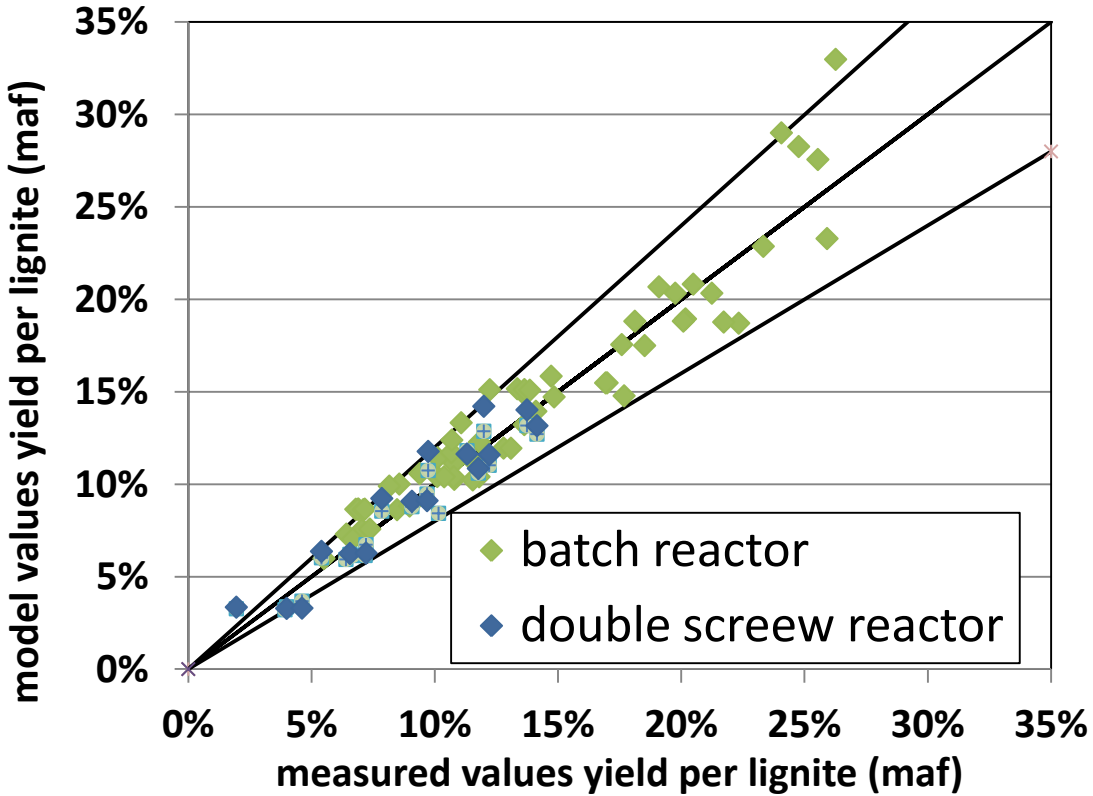
Adsorption model:

- adsorption on crystallite surface

➔ amount of volatiles

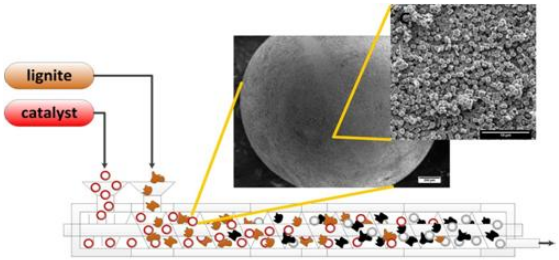
- reaction on external and internal surface

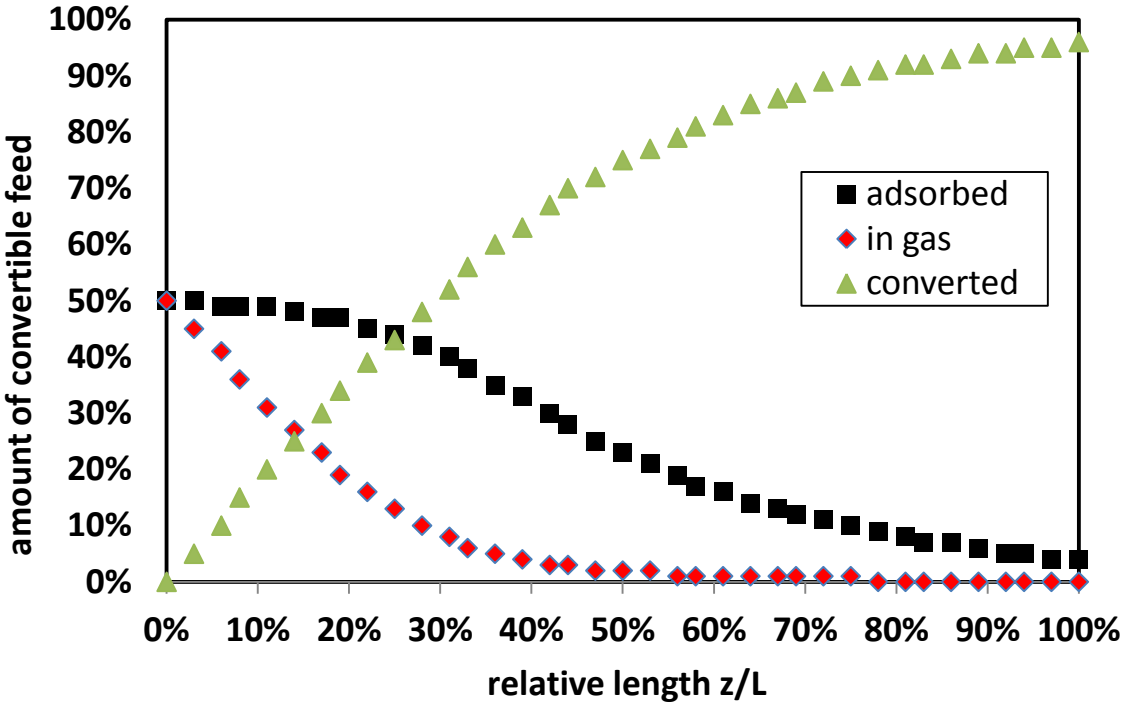
➔ catalyst



Modeling

simulation for
a double
screw reactor





Summary

- lignite, polyolefins and biomass can be converted similar with acid catalysts
- the product distribution can be influenced by catalysts and the process conditions
- a model describes the behaviour for batch and a double screw reactor well (lignite)
- next step: product distribution has to be modelled

Acknowledgement

for cooperation

ibi INNOVATIVE BRAUN-KOHLEN INTEGRATION IN MITTELDEUTSCHLAND

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Innovative Process Technology

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GEFÖRDERT VOM

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