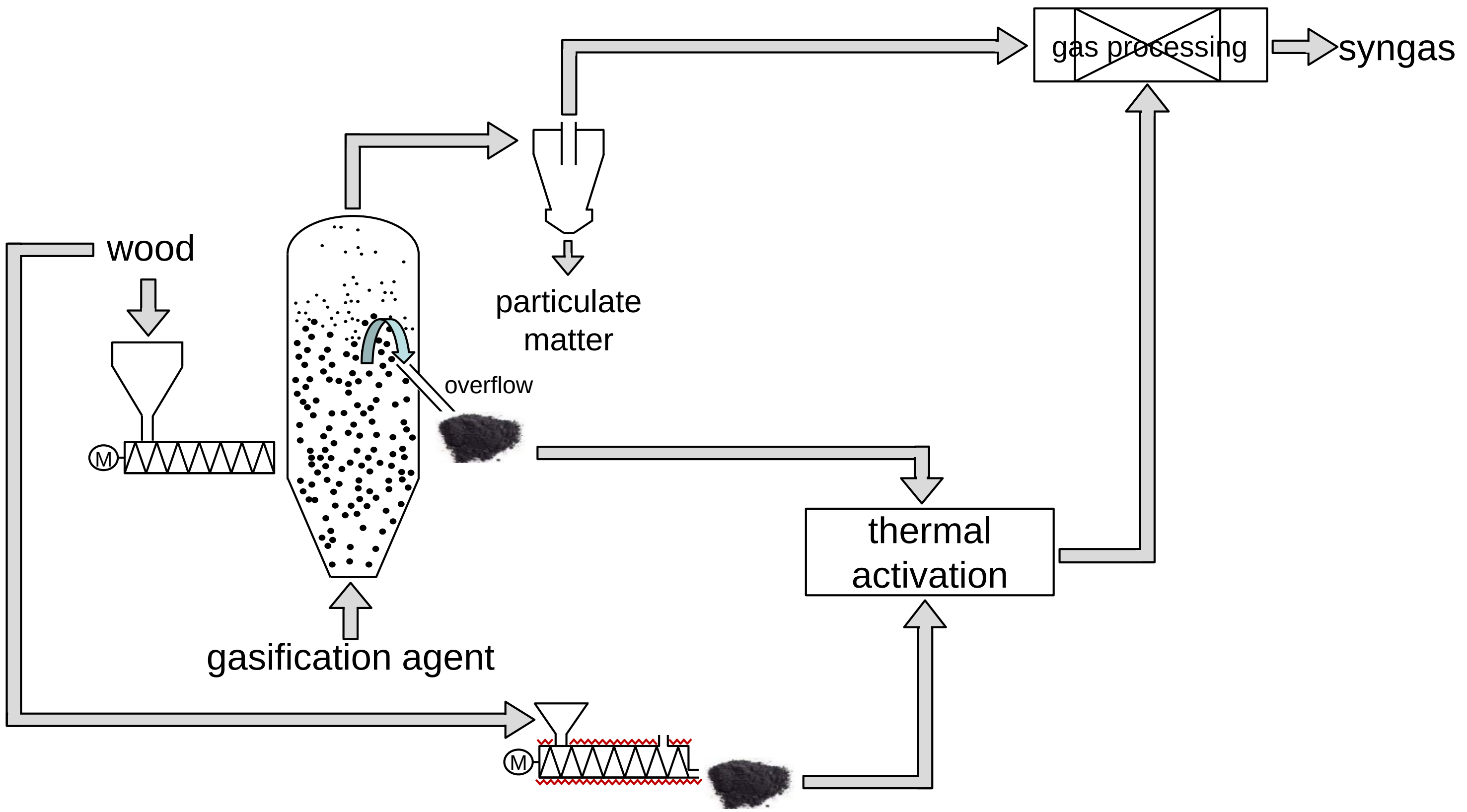
Gas Cleaning with Activated Process Materials

Omid-Henrik Elhami

Institute of Energy Engineering | NWG-TCKON | Gas Analysis Workshop Berlin, 07.09.2017

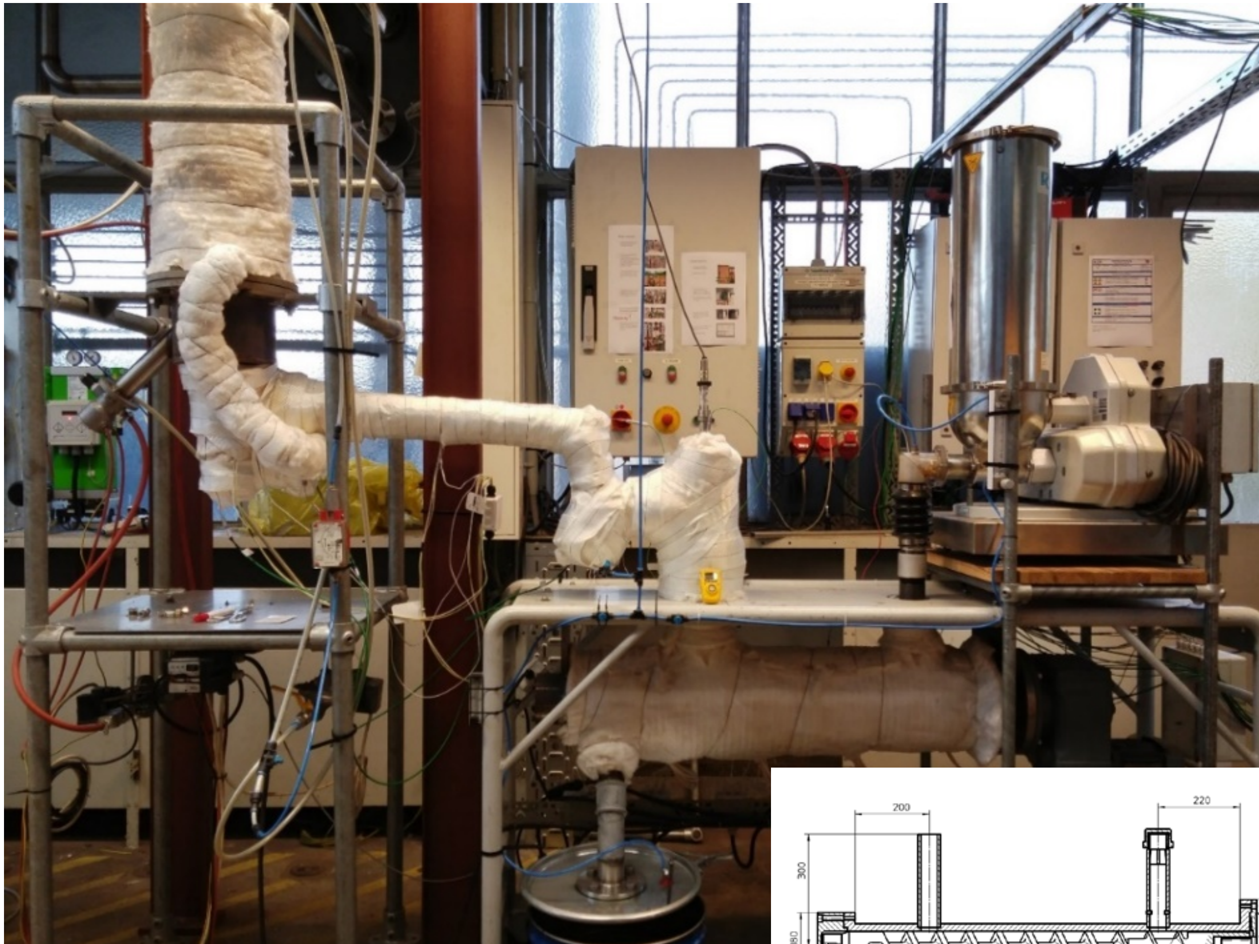
Approach

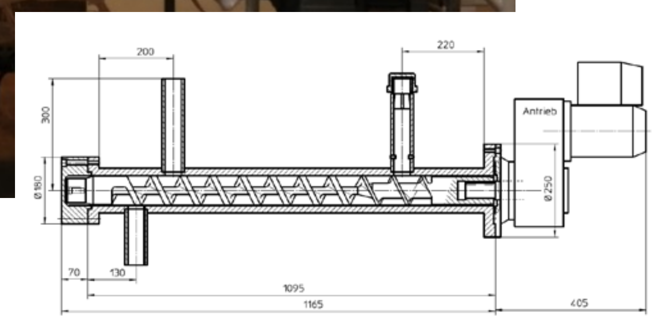


Objectives:

- Study on the effect of the gasification agent and the gas composition on the pore structure
- Finding a suitable pore structure for tar adsorption
- Investigations on PAH adsorption on activated process char

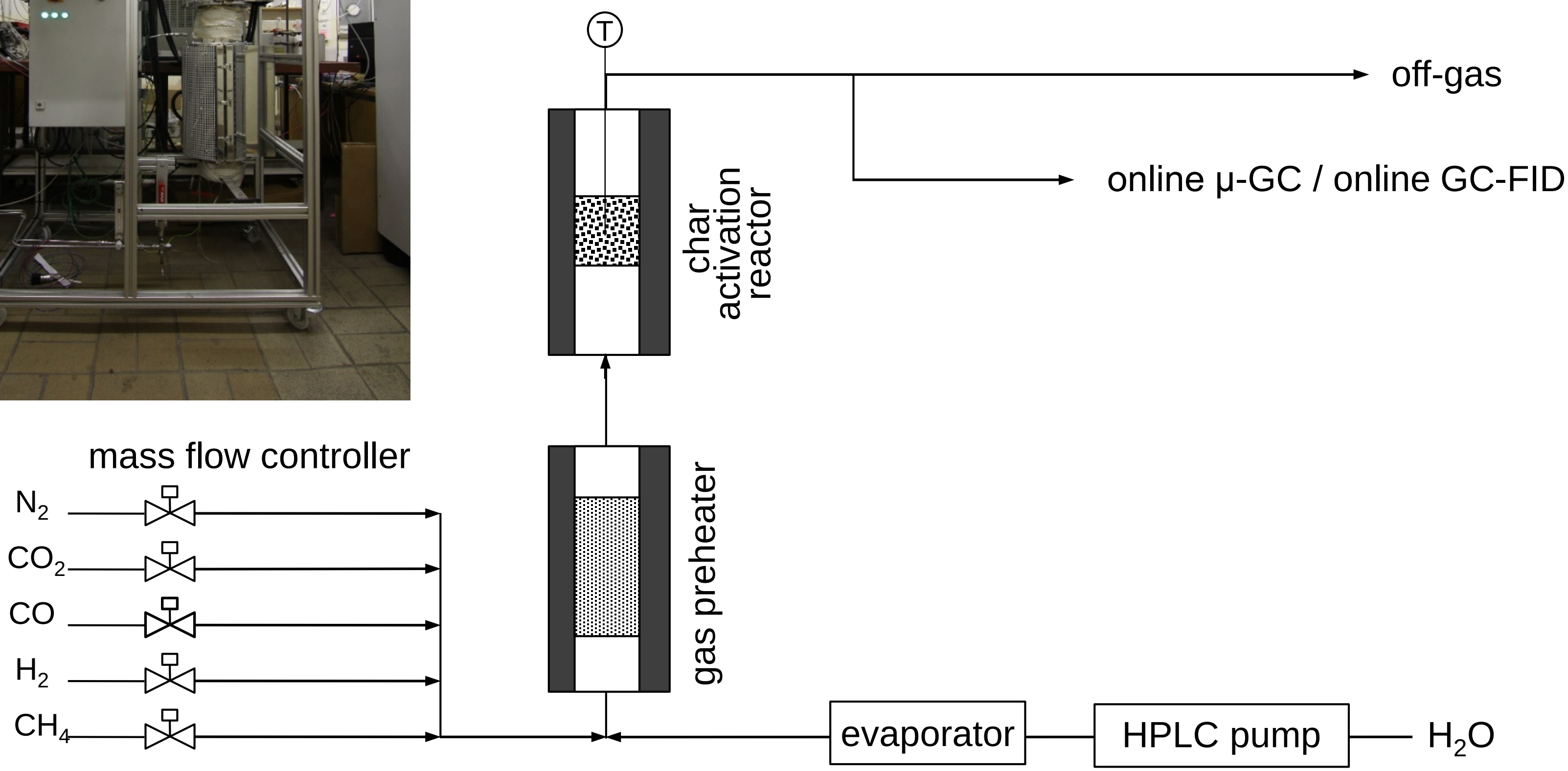
Experimental set-up: screw-type pyrolysis unit



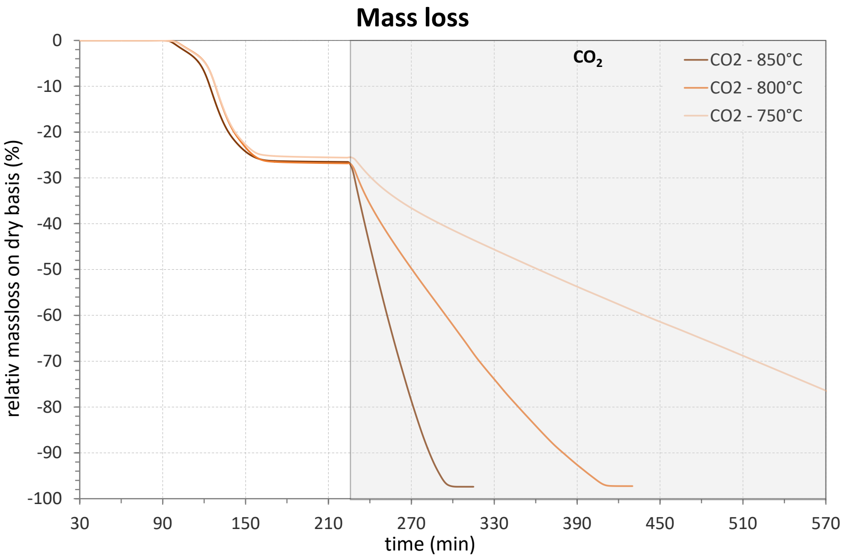


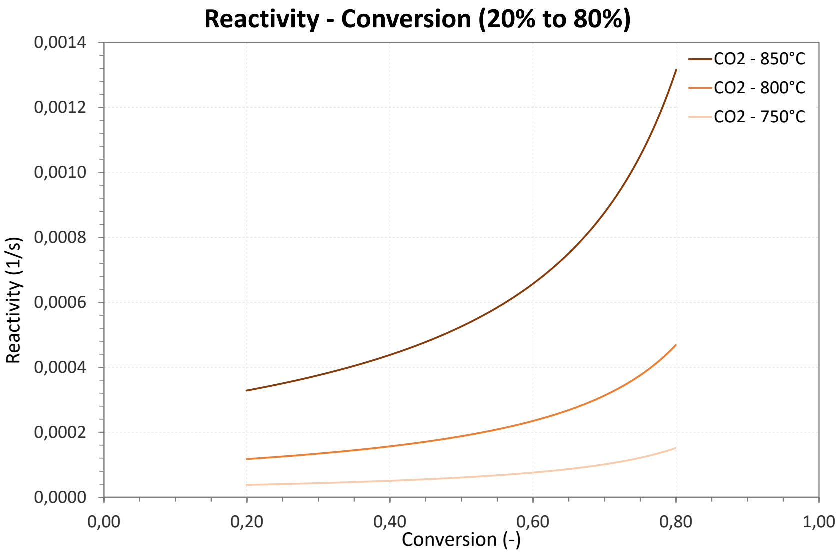
Experimental set-up: activation reactor

- reactor d_i: 80 mm
- bed height: 200-300 mm
- temperature 750-800°C

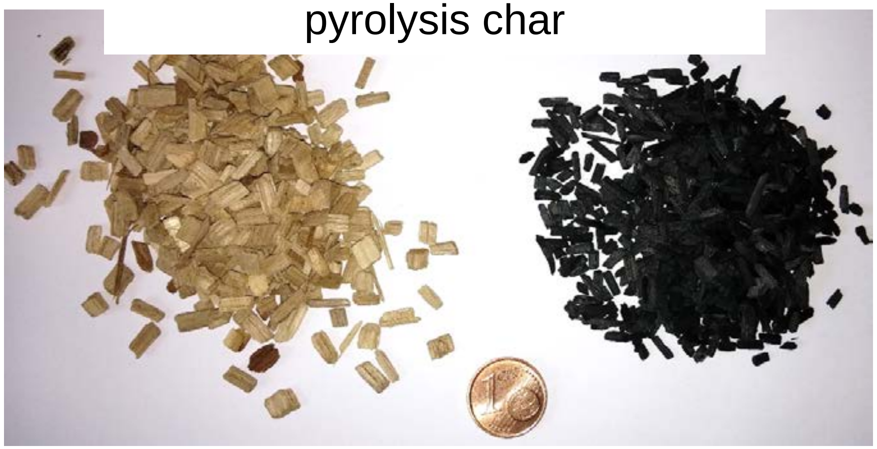


Thermogravimetric analysis





Characterization of starting materials and activated char



samples	Wood (Beech)	pyrolysis char	activated char	process char (pine)
process conditions	-	400°C 30 min	750°C 180 min	~850°C unkn. duration
fixed carbon (%)	14,1	71,1	93,4	87,3
S_{BET} (m^2/g)	< 5	7	580	170
micropores (cm^3/g)	-	-	0,220	0,039
total pore volume < 250 nm	-	-	0,250	0,160

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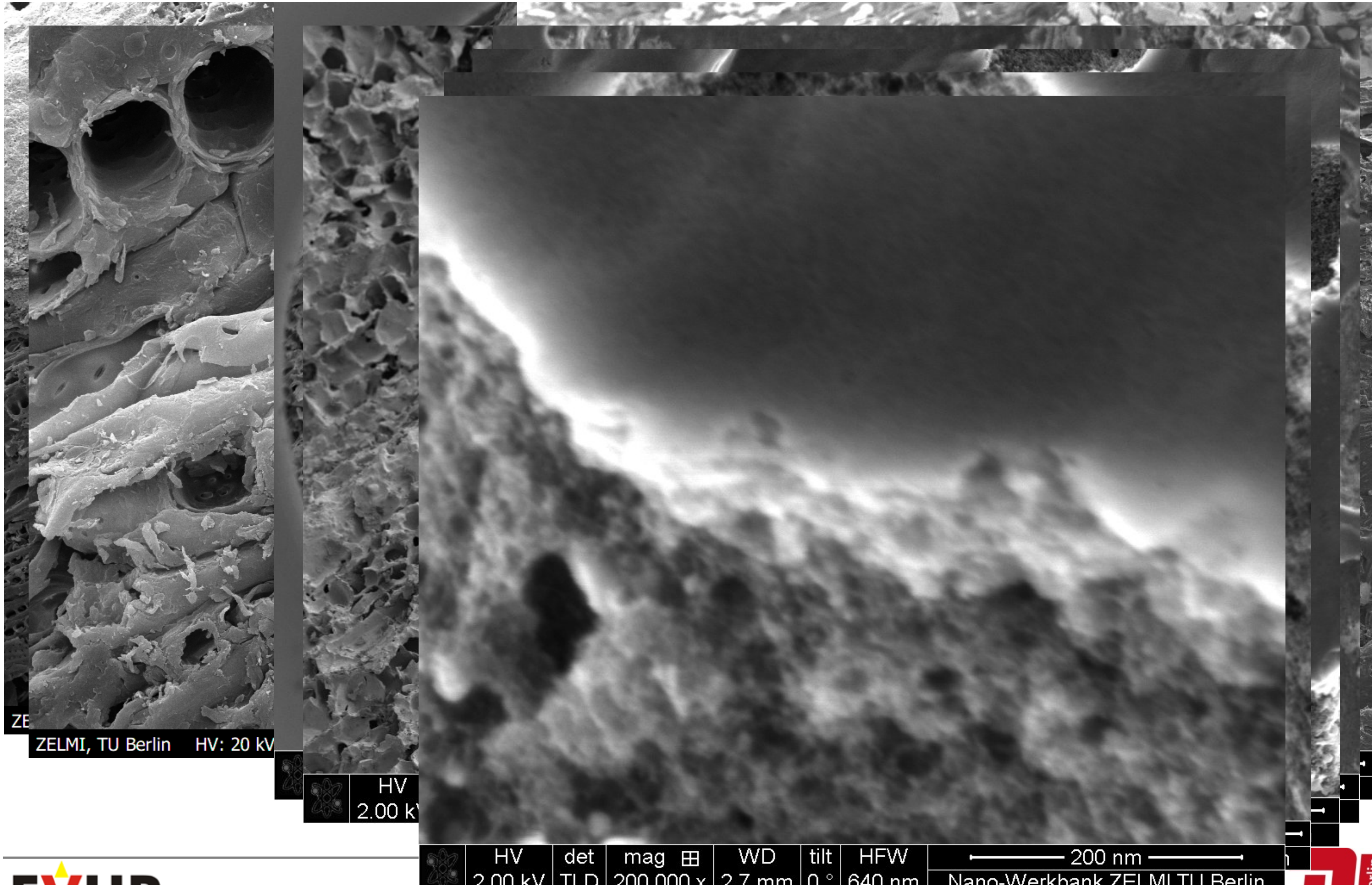
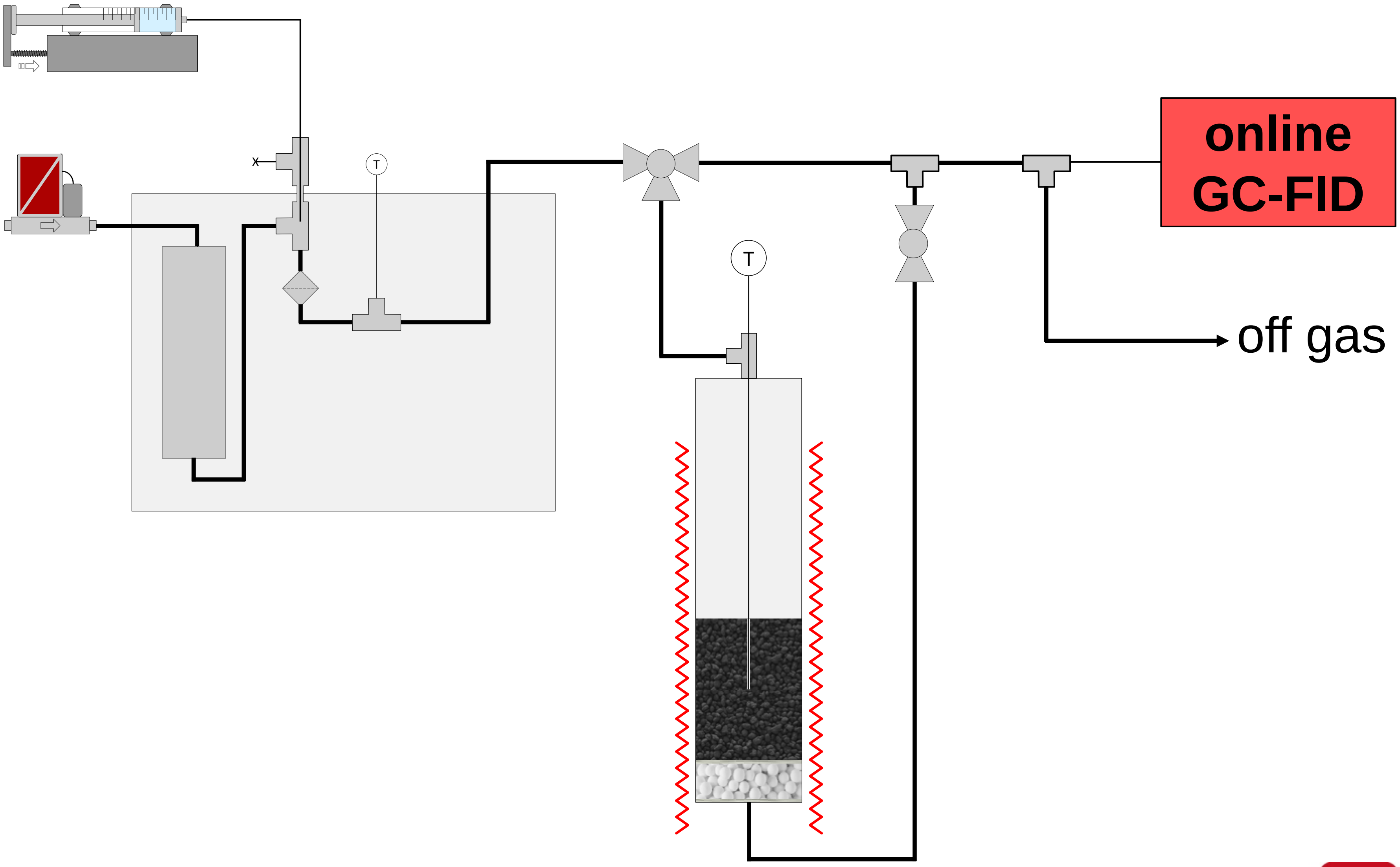
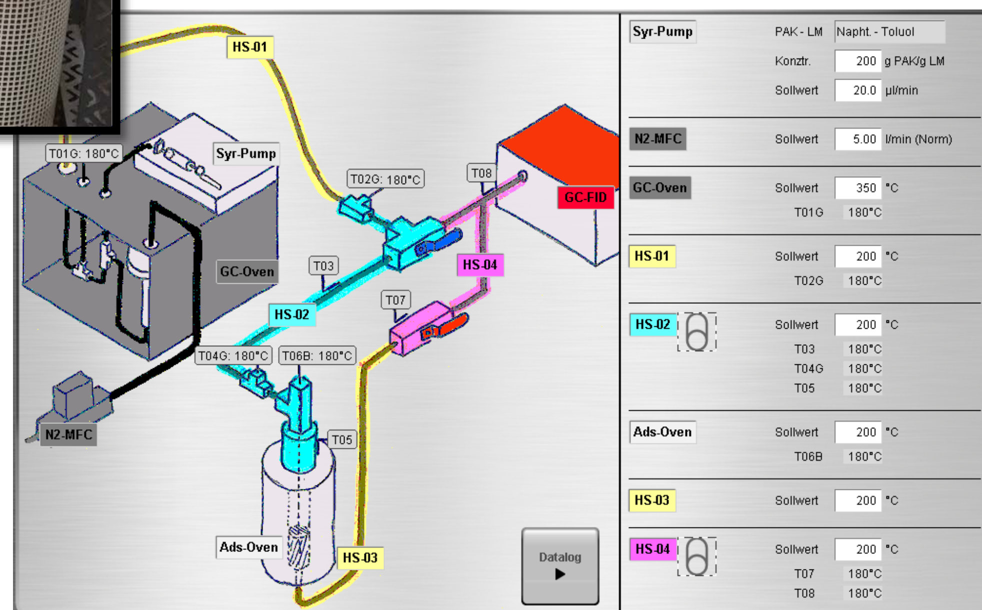
SEM Pictures of starting materials and products



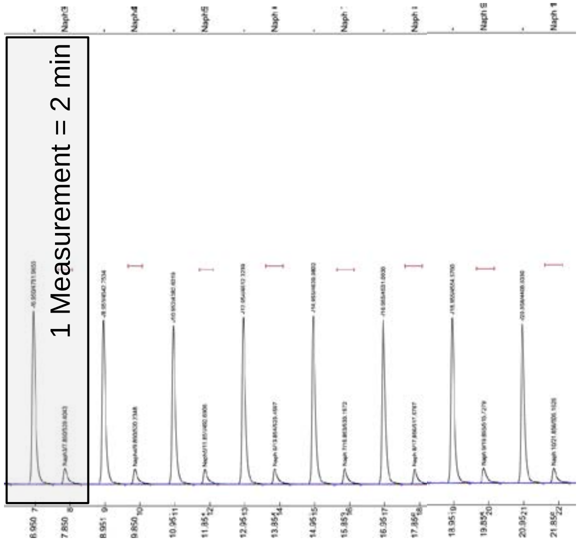
Experimental set-up: adsorption reactor

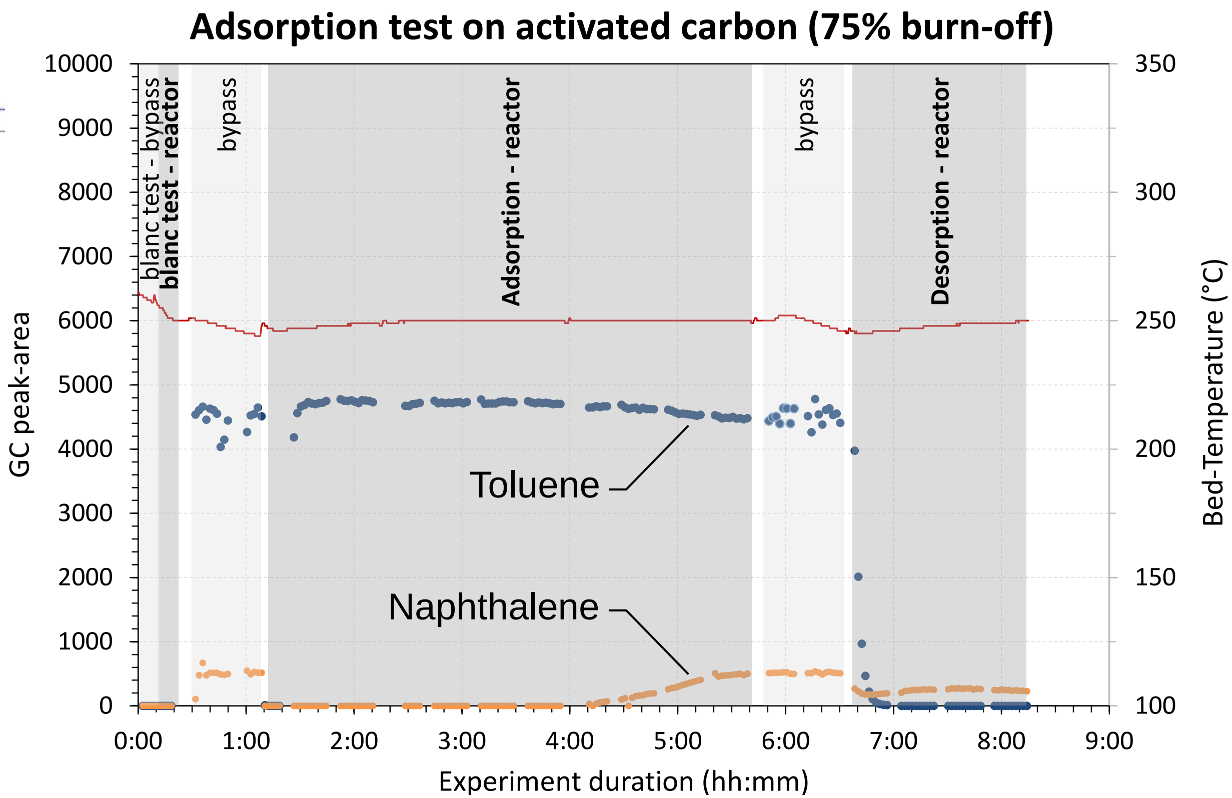


Experimental set-up: adsorption-reactor



Obtainig a breakthrough curve





PAH test-gas generator

Figure 3.9: Photo of solid PAH substances reservoir

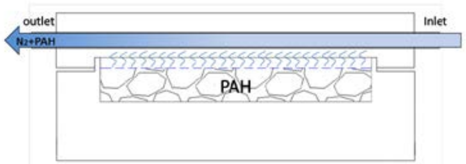
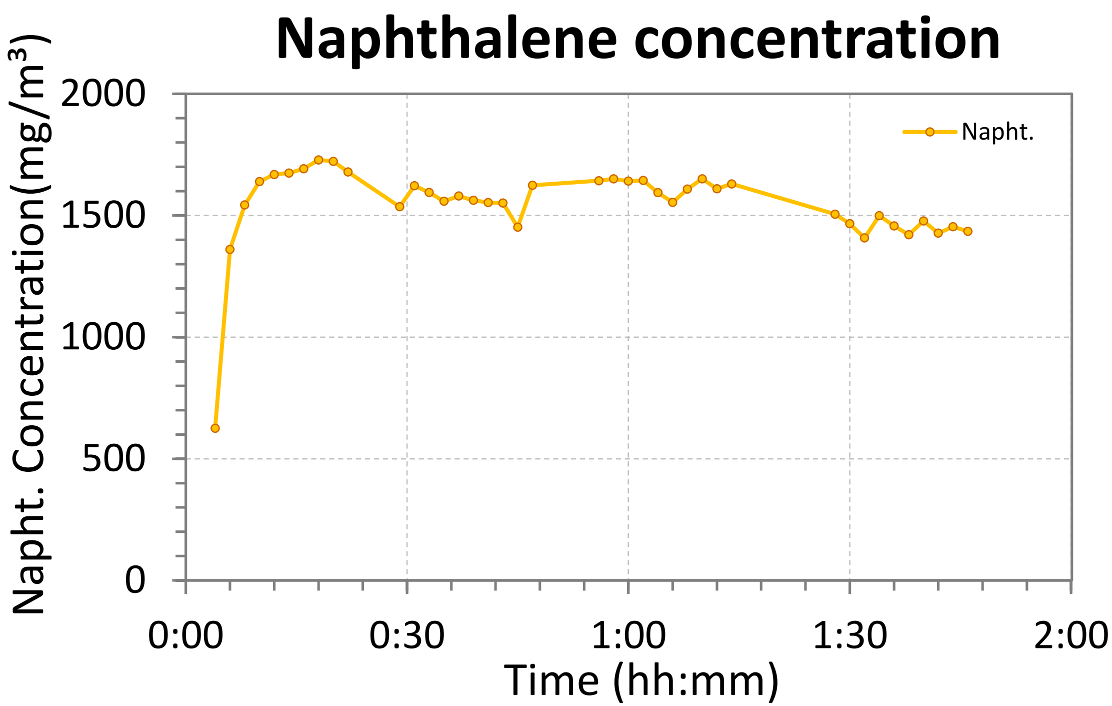
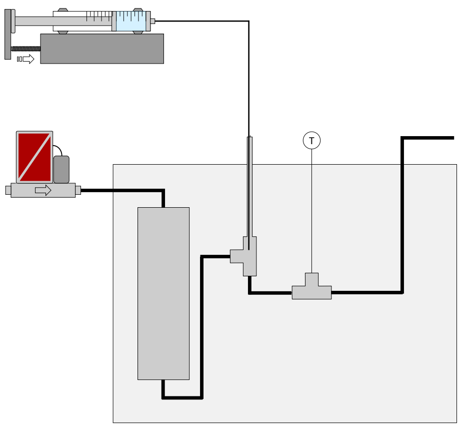


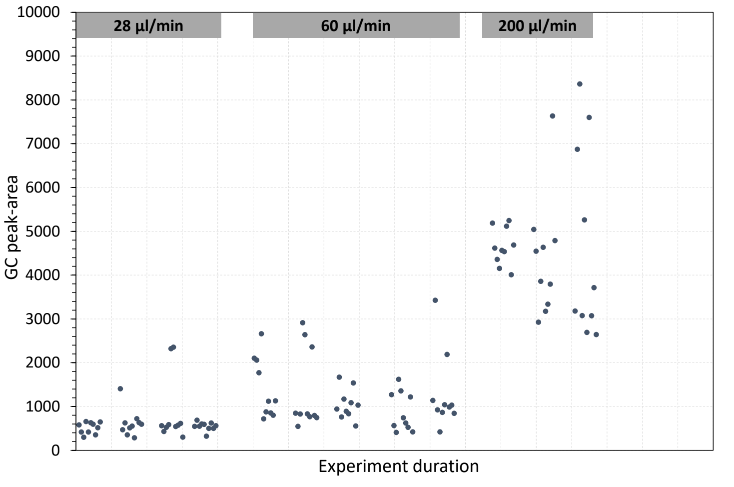
Figure 3.10: Schematic diagram of solid PAH substances reservoir



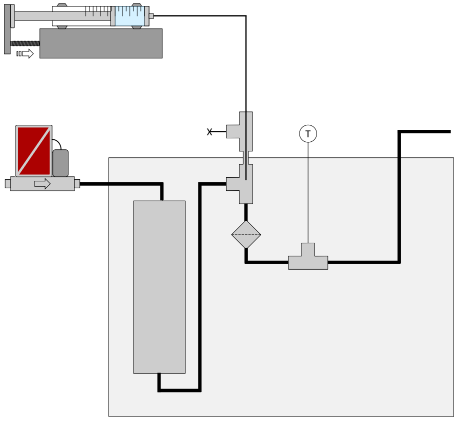
PAH test-gas generator

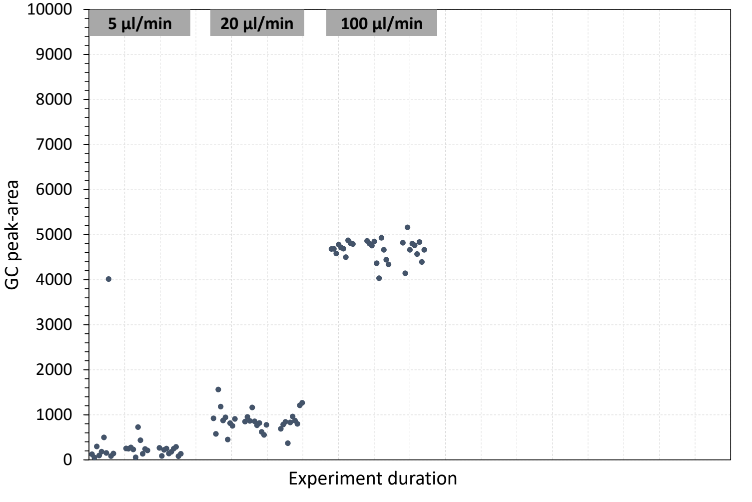
- Version 1



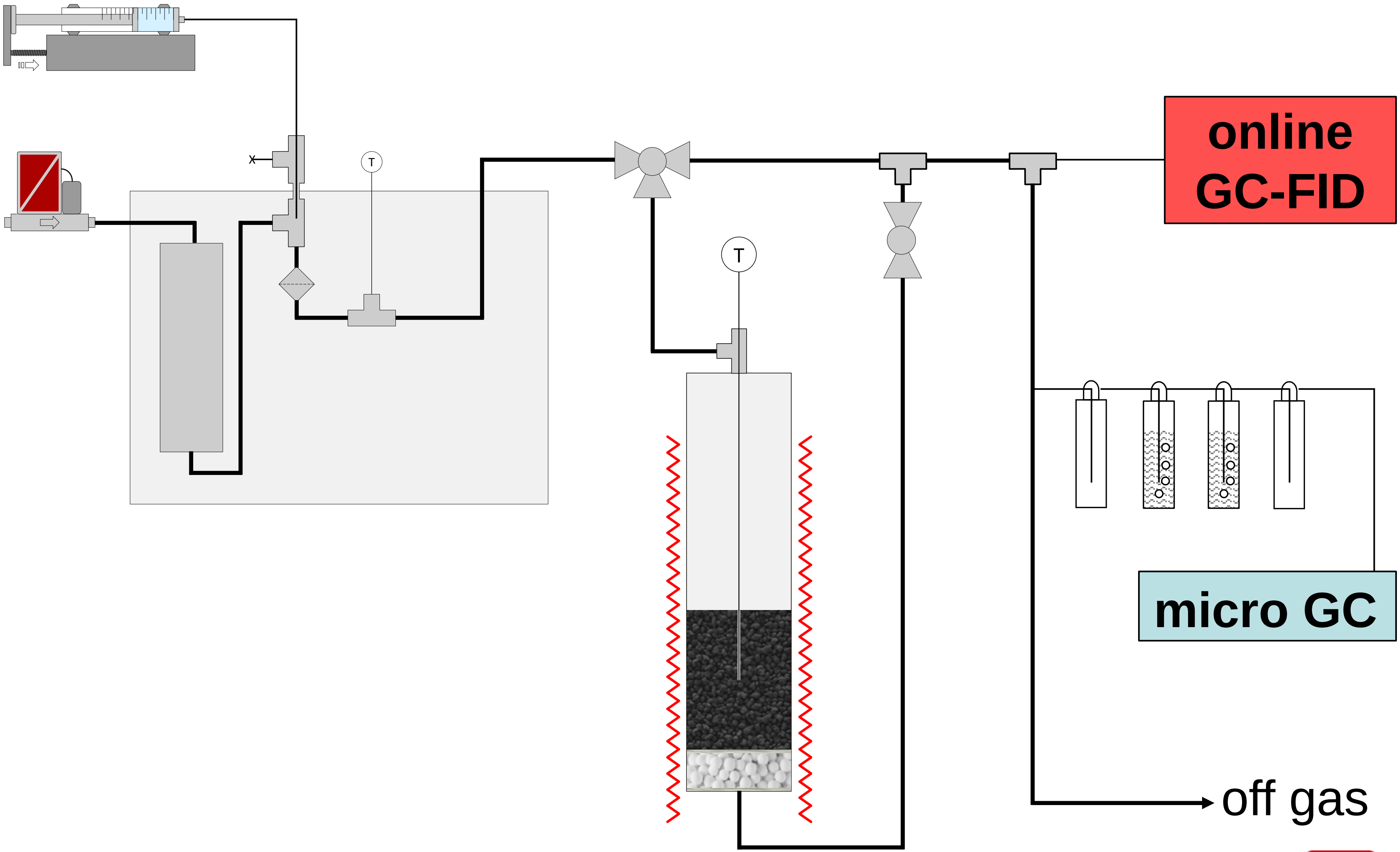


- Version 2





Current work



Acknowledgement

Thank you for your interest and your attention

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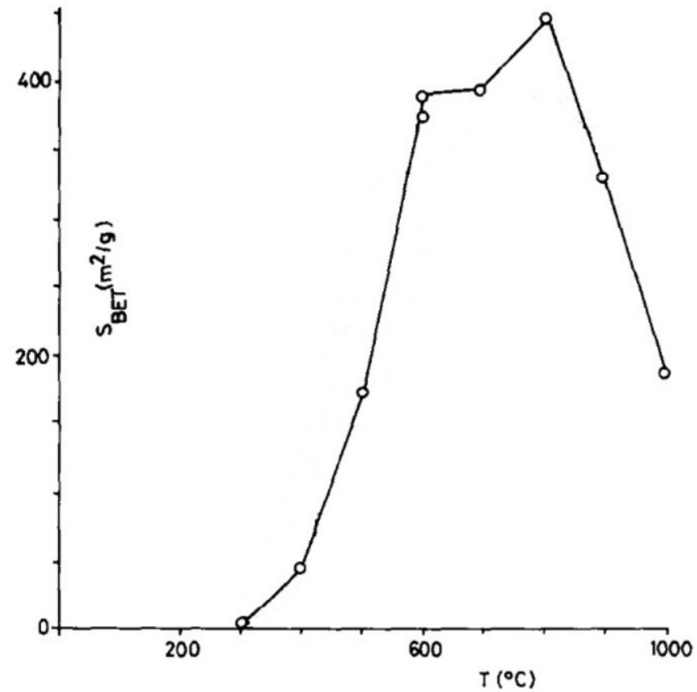
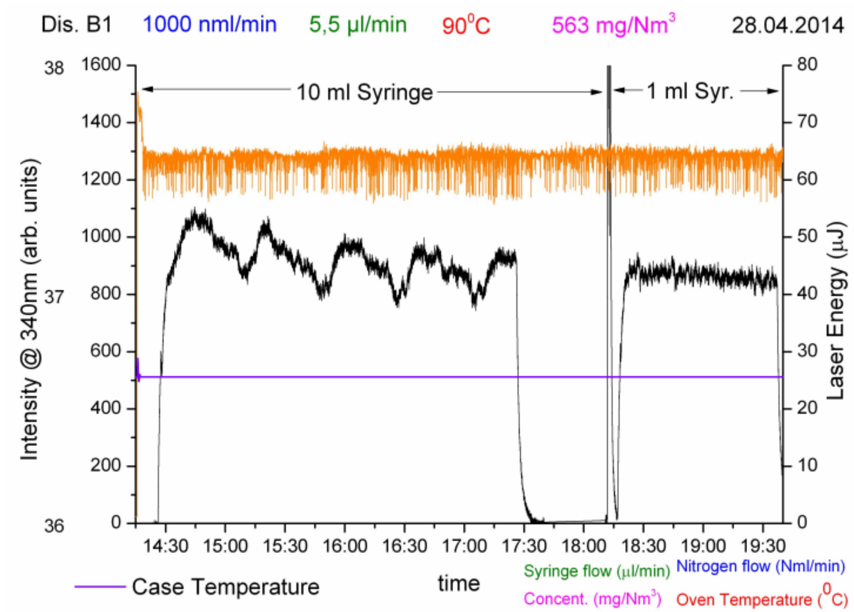
Back up



400
200
0
200
600
1000
S_{BET} (m^2/g)
T (°C)



Dis. B1
1000 nml/min
5,5 µl/min
90°C
563 mg/Nm³
28.04.2014
10 ml Syringe
1 ml Syr.
Intensity @ 340nm (arb. units)
Laser Energy (µJ)
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
time
Case Temperature
Syringe flow (µl/min)
Nitrogen flow (Nml/min)
Concent. (mg/Nm³)
Oven Temperature (°C)