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PROMETHEIA

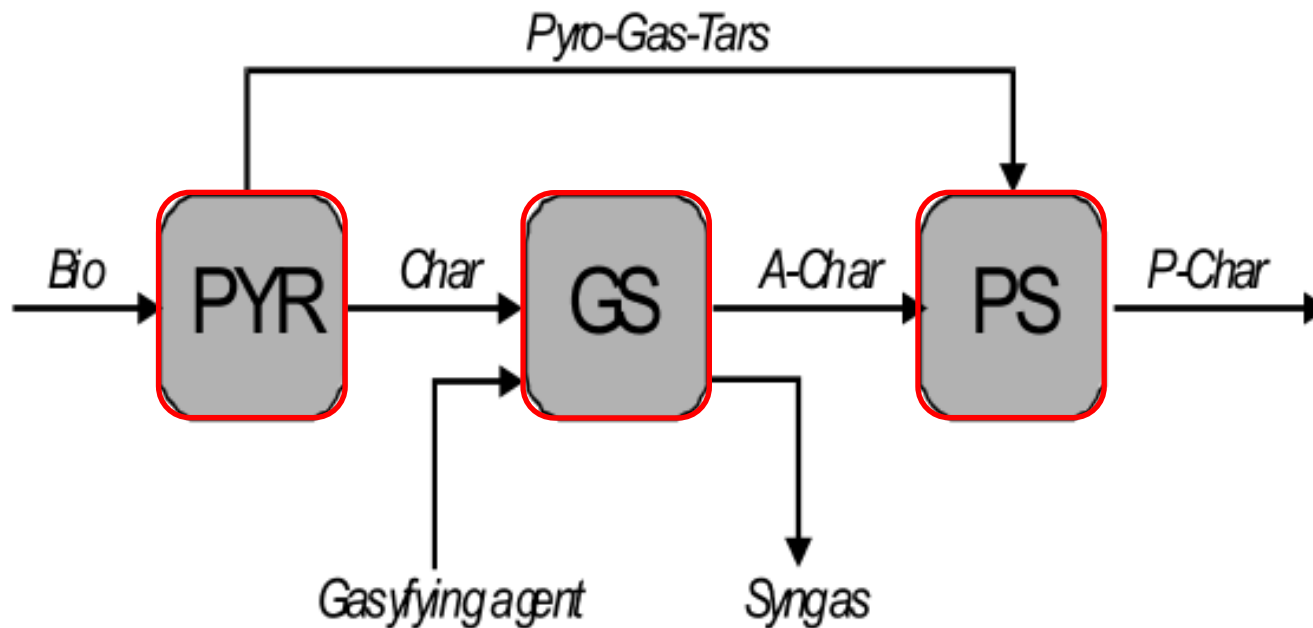
Processus for metal-to-char encapsulation

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Main Phases of the Project

- Pyrolysis (PYR)
- Gasification (GS)
- Passivation (PS)



+ Life cycle assessment – carbon footprint

Aim of the Project: heavy metals retention in the solid phase and using biochar as valuable source



- Degradation of organic compounds
- Reduction of weight (80% → 20%)
- Tar production → high coking tendency
- Inert atmosphere

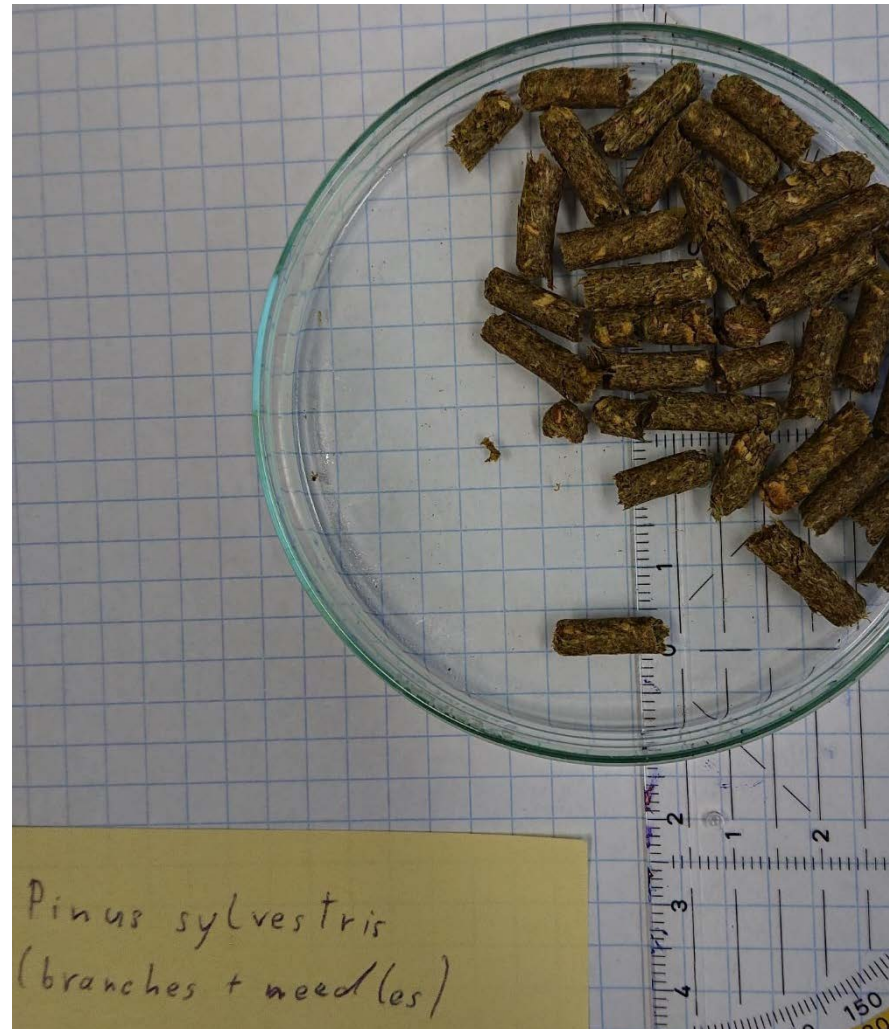
- Activation process. Removal of blockages on char Surface
- Gasification agent

- Coking of tar compounds at the Surface of the activated char
- Low reactive layer at the surface
- Use of tars with high carbon content

- plants (softwood, hardwood, herbaceous)



Fig. 1: pinus sylvestris (softwood) [1]



- Three type of plants (softwood, hardwood, herbaceous)



Fig. 2: *betula pendula* (hardwood) [2]



Fig. 3: *phragmites australis* (herbaceous) [3]



- 3 plants (softwood, hardwood, herbaceous)
- HM-contaminated samples from a site in Poland (mainly Pb, Zn, Cd)



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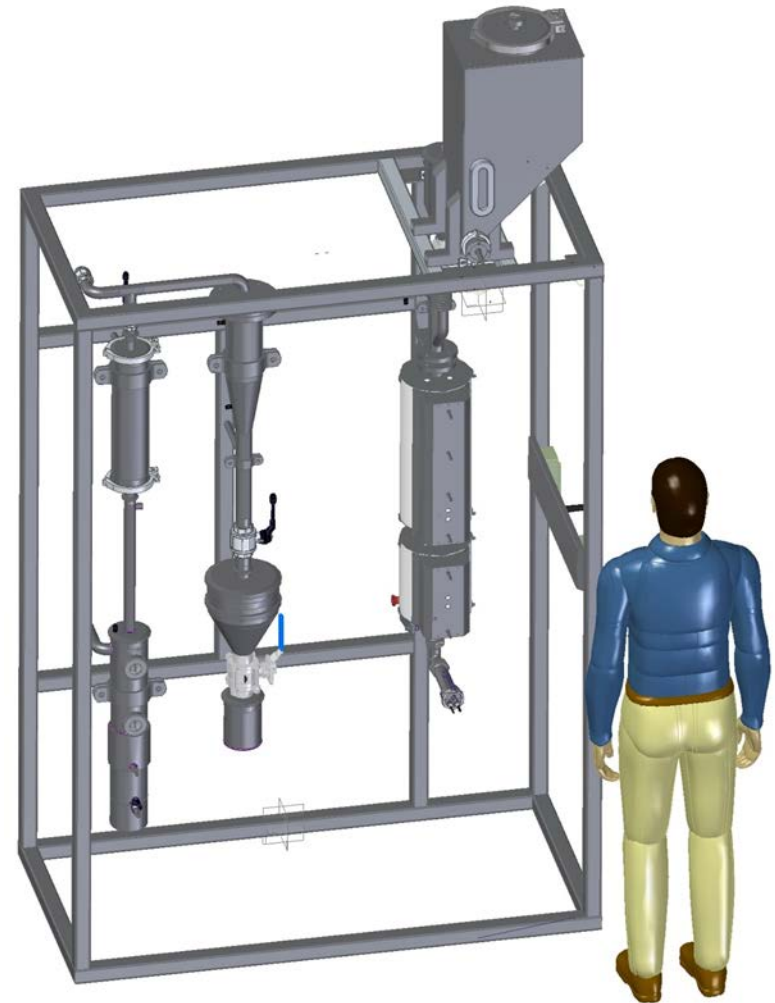
HM-Analysis

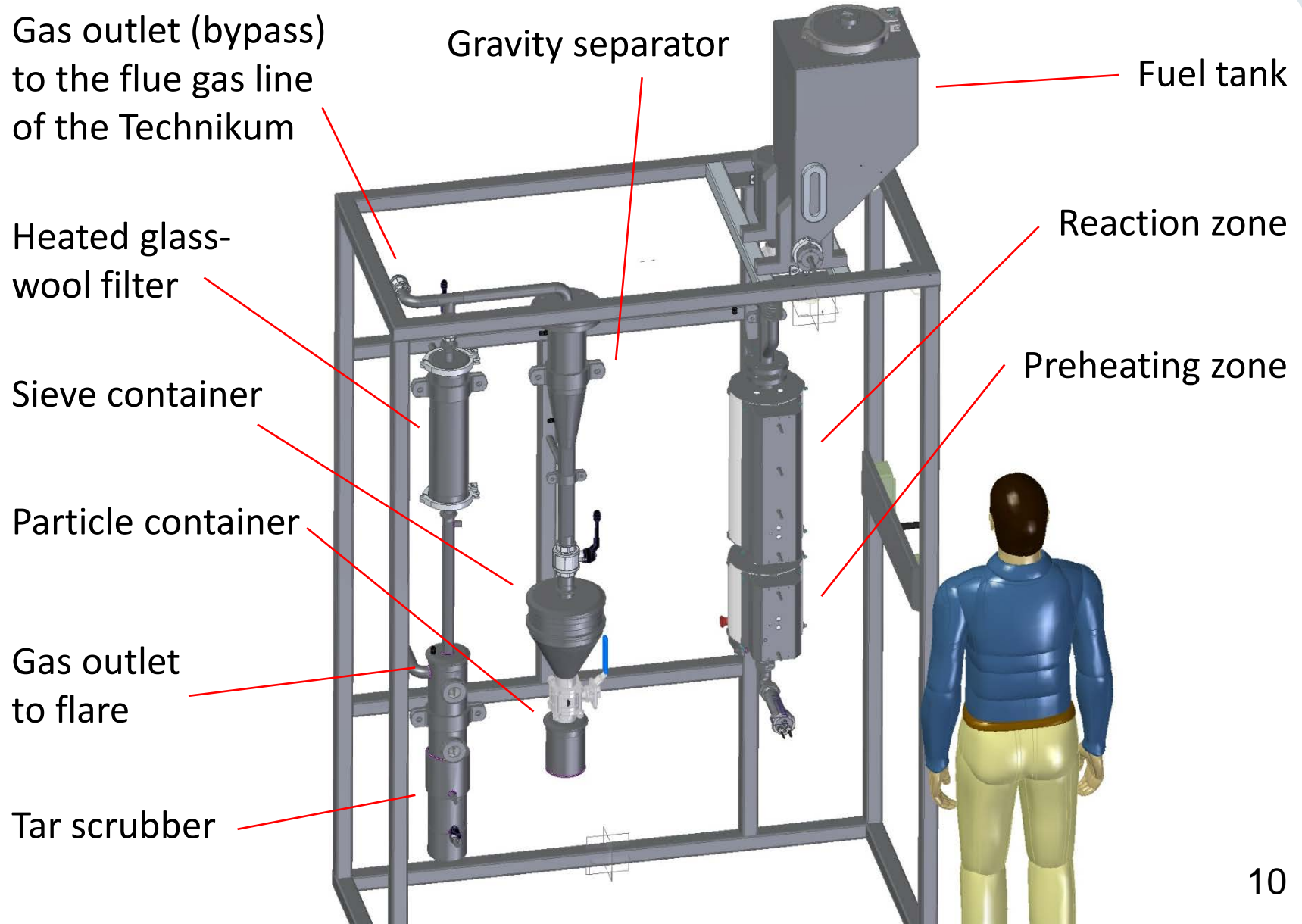
- 5 types of pellets have been chosen
- *Pinus sylvestris* (contaminated/uncontaminated)
- *Betula pendula* (contaminated/uncontaminated)
- *Phragmites australis* (contaminated)
- 24 elements investigated via ICP-OES
- Halogenides and SO_4 are investigated via ion chromatography



BIOTA – Biogenic, Innovative and Optimized Thermochemistry Apparatus

- Fixed bed/fluidized bed mode
- Elaborate flue gas treatment
 - Gravity separator for big particles and bed material
 - Heated glass wool filter
 - Scrubber for tars





[1] Pinus sylvestris. Sint-Oedenrode: Van den Berk Baumschulen; [accessed 15 November 2021]. <https://www.vdberk.de/baume/pinus-sylvestris/>.

[2] Betula pendula. Sint-Oedenrode: Van den Berk Baumschulen; [accessed 15 November 2021]. <https://www.vdberk.de/baume/betula-pendula/>.

[3] Gemeines Schilfrohr (Phragmites australis). Saarbrücken: Neue Medien Dominik Hammerschmidt; [accessed 16 June 2023]. https://www.gartenratgeber.net/pflanzen/gemeines-schilfrohr-phragmites-australis.html?utm_content=cmp-true.

[4] <https://www.technologynetworks.com/analysis/articles/icp-oes-icp-chemistry-icp-oes-analysis-strengths-and-limitations-342265>. [accessed 09 February 2022].