



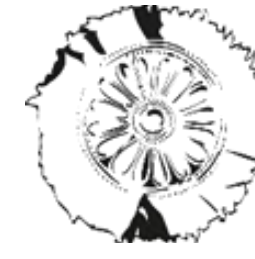
Flexible chemical looping combustion for combined heat and power production from biogenic residues with negative emission



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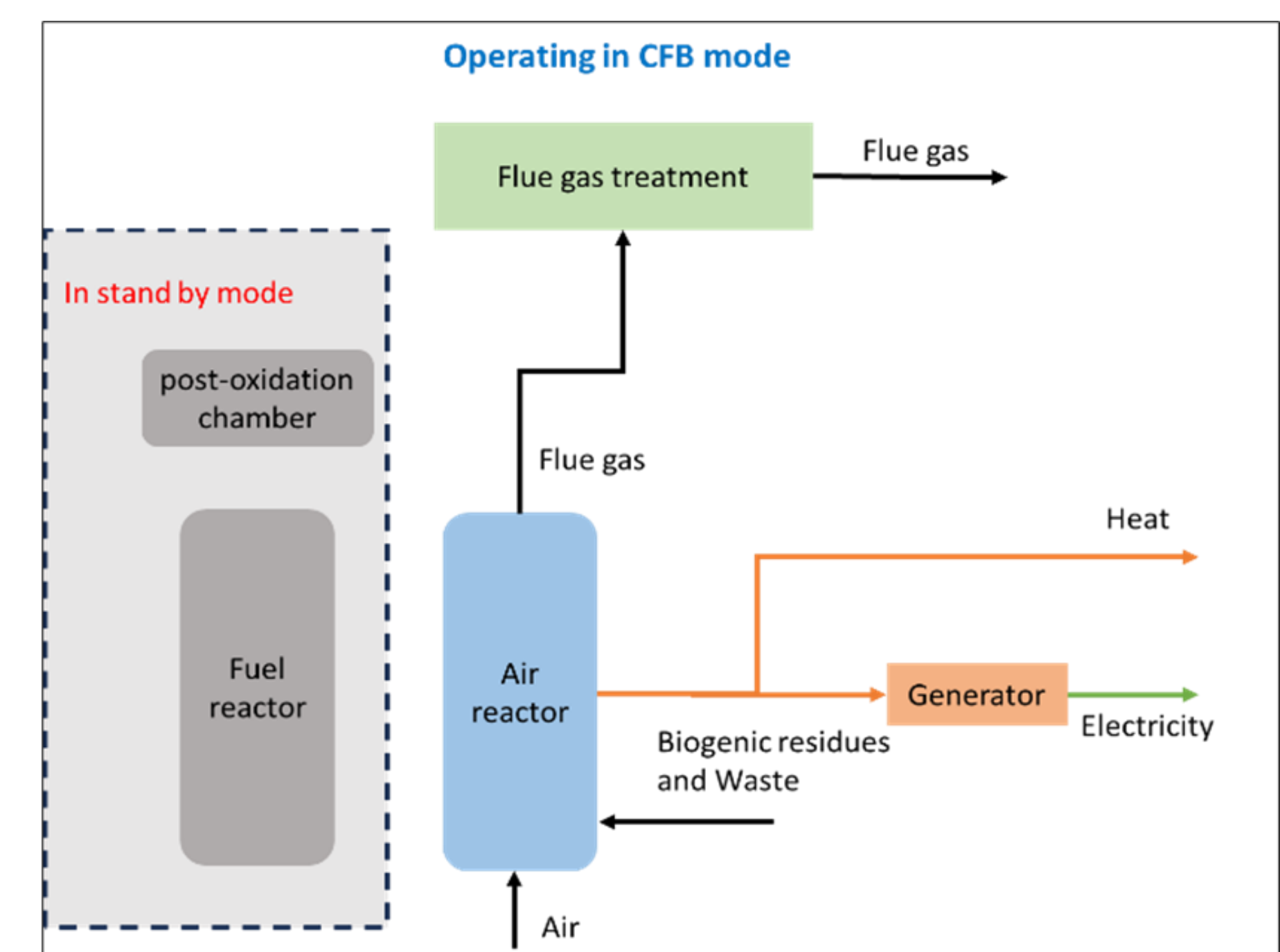
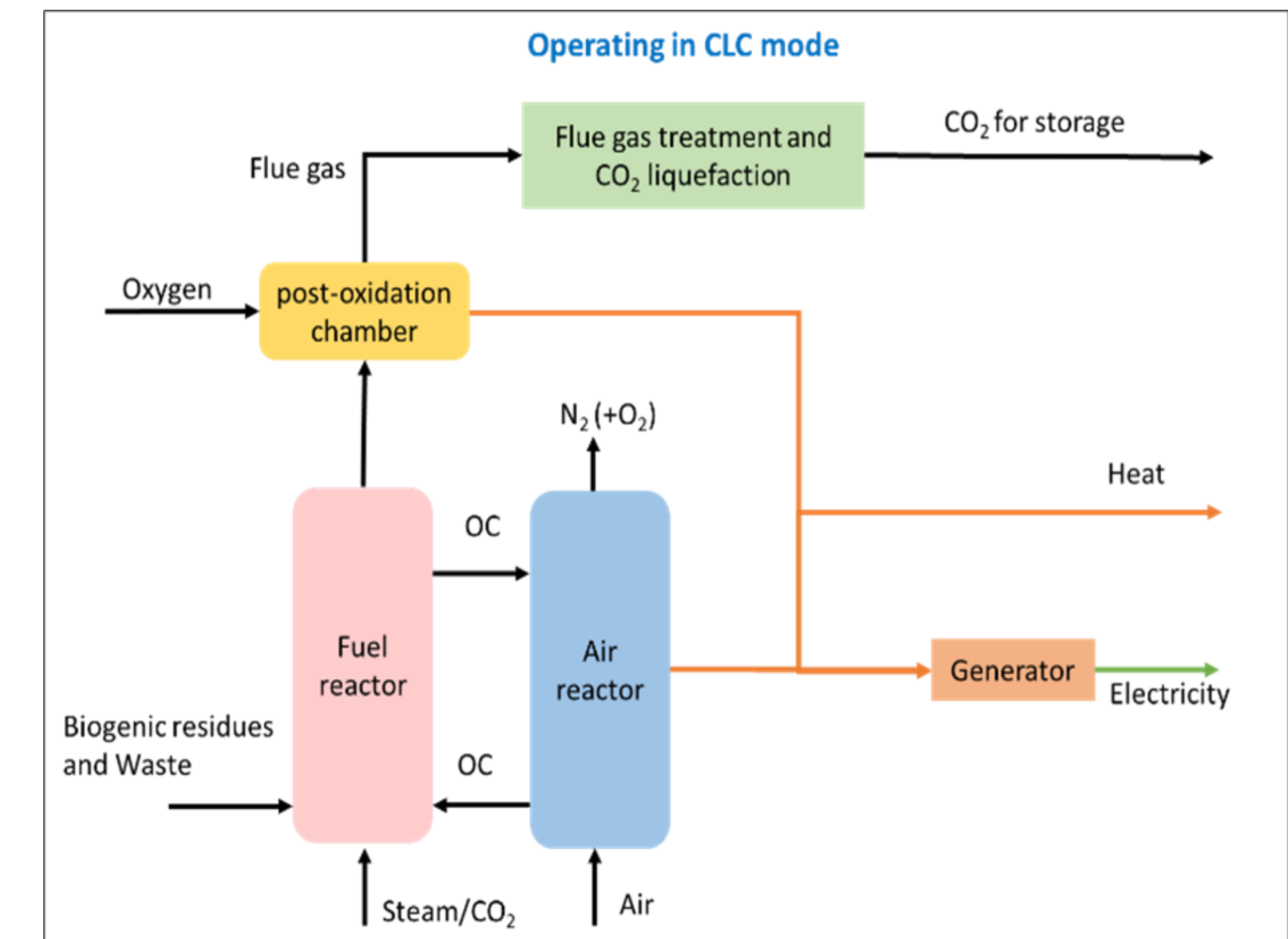
Aim of the project

Bio-FlexCLC develops and demonstrates a full-chain technology at TRL 5 that uses biogenic residues and waste as feedstock for flexible combined heat and power (CHP) production, with cost-effective CO₂ capture.



Advantages

- **Compatibility with existing infrastructure:** Based on proven fluidized-bed combustion technology, enabling strong integration with existing heat and power infrastructure.
- **Operational flexibility:** Can switch to conventional CFB combustion when carbon capture is not economically attractive, while handling load and feedstock variations.
- **Efficient CO₂ capture:** CLC enables inherent, low-energy-penalty CO₂ capture that automatically adapts to load changes.
- **Negative emissions:** Can use biogenic residues and waste to deliver low-cost carbon dioxide removal (CDR).
- **Reduced gas flow:** In CLC mode, ash and emissions are concentrated in the fuel reactor, reducing gas flow to about one-quarter of conventional combustion.
- **Higher efficiency:** Enables supercritical steam generation and higher electrical efficiency by separating corrosive emissions from the air reactor.
- **Lower emissions:** CLC reduces SO_x and NO_x emissions.



Methodology

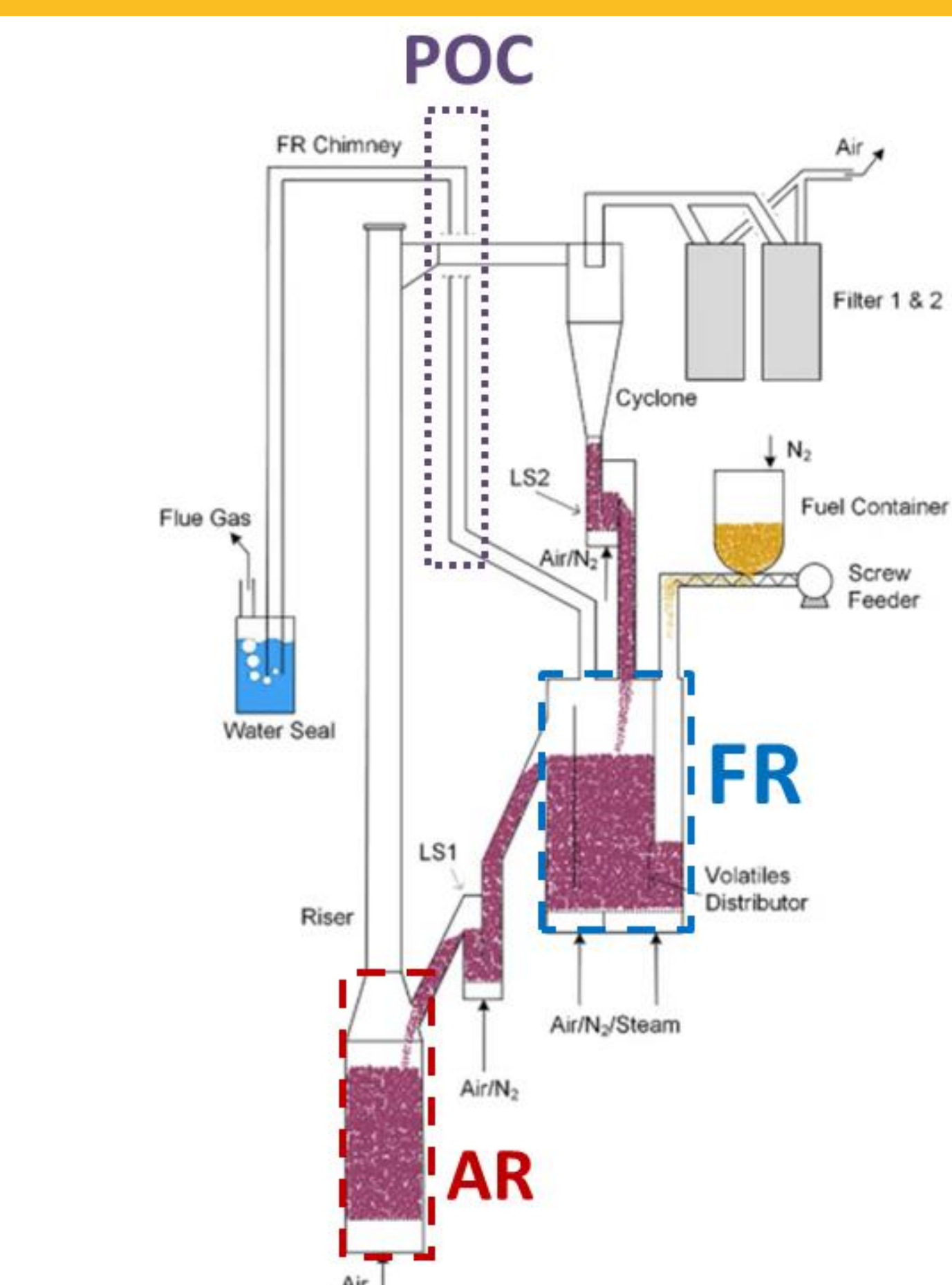
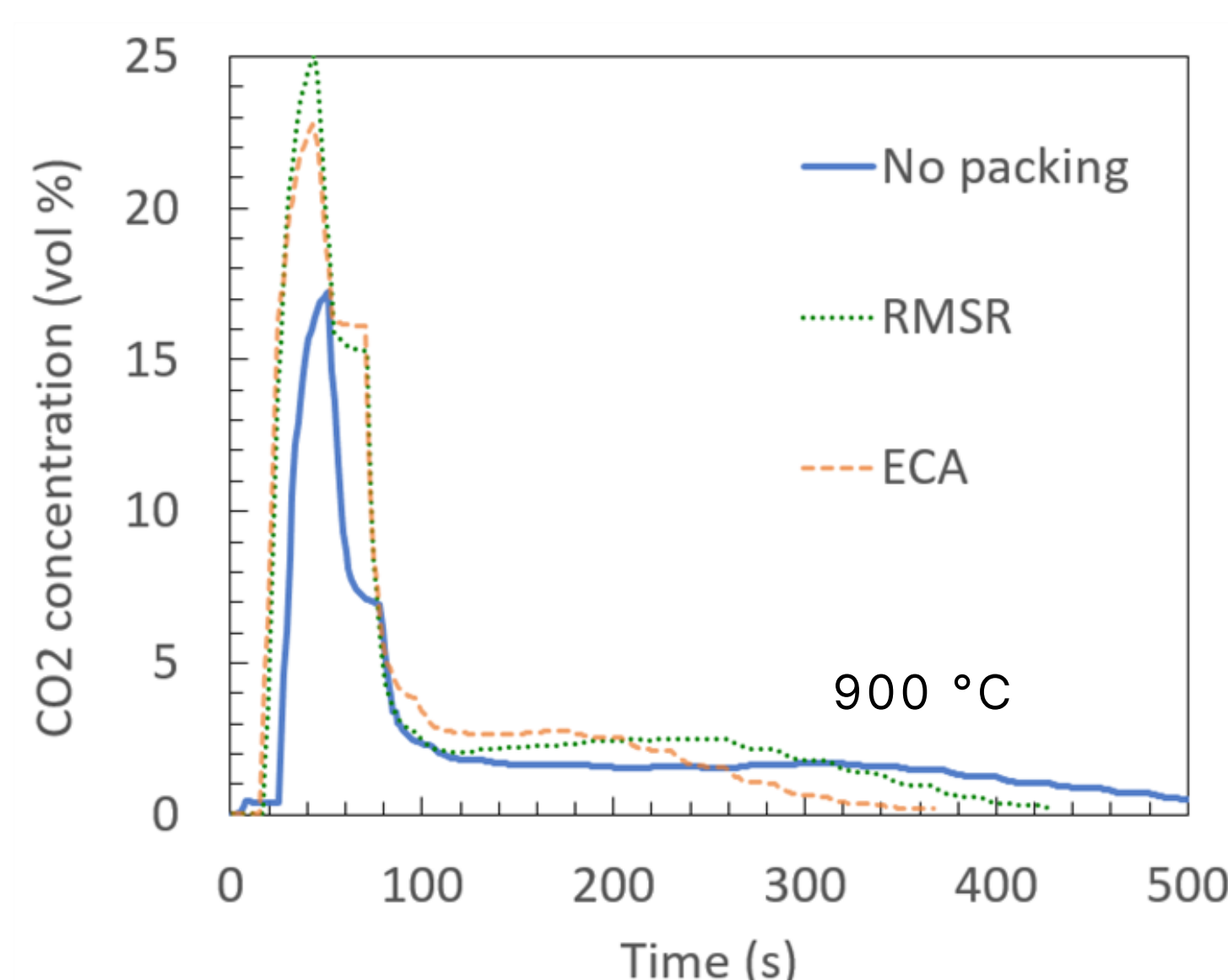
ANALYSIS (wt. %)	Pine wood pellets	Olive stones	Spruce chips	Refused-Derived Fuel
Moisture	7.5	7.3	8.0	2.8
Ash	0.2	0.3	2.5	11.8
Volatiles	77.1	74.9	72.1	76.9
Fixed carbon	15.1	17.4	17.5	8.5
C	47.2	47.8	46.7	55.0
H	5.6	5.3	5.4	6.6
N	0.1	0.2	0.4	0.9
S	<0.1	<0.1	<0.1	0.3
O (by diff.)	39.4	39.1	37.0	22.6
Cl (g/kg)	0	0	0.2	9.0
LHV (kJ/kg)	17042	17352	16808	23211

Feedstock analysis, along with their elemental and proximate analyses

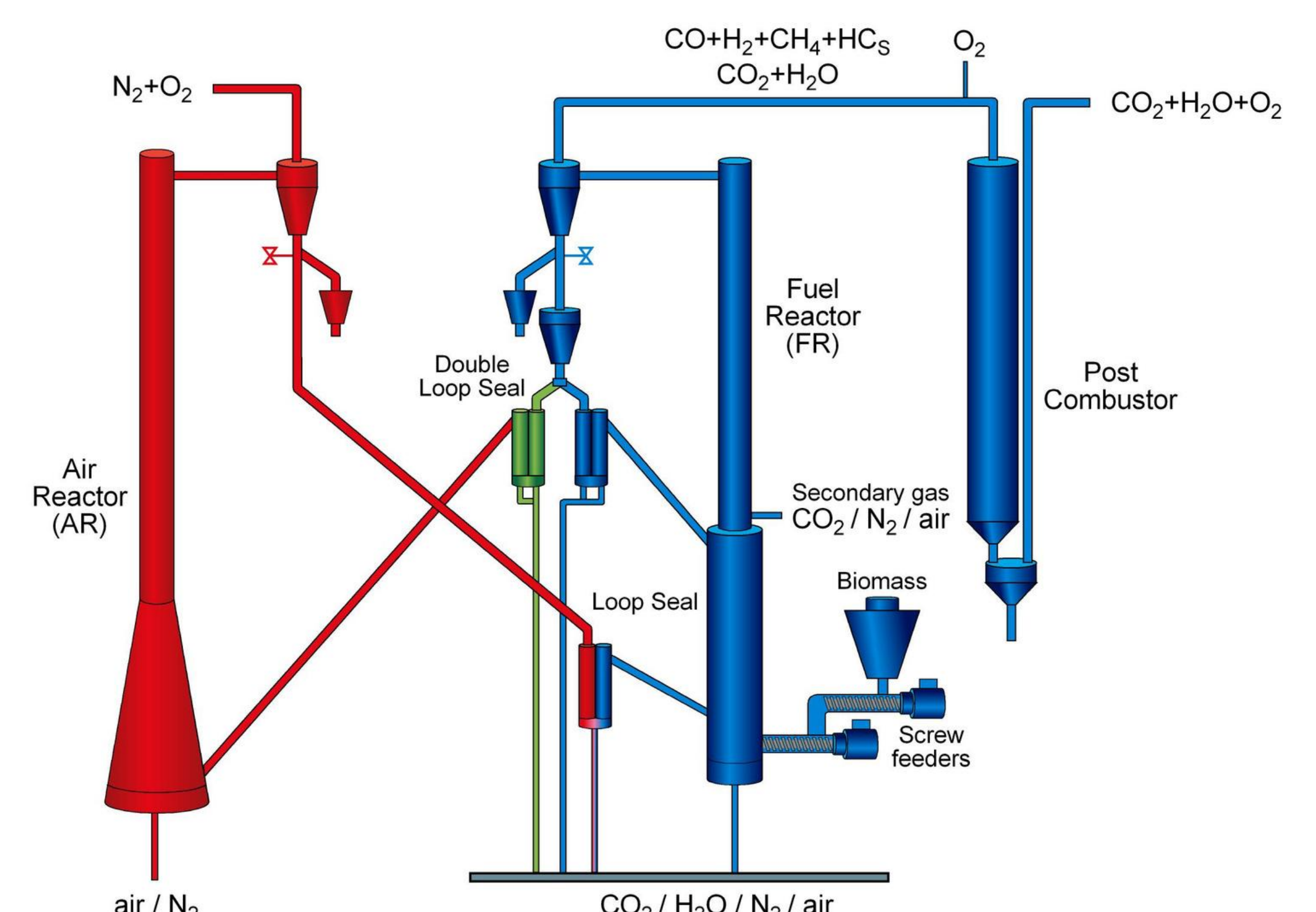


1MW pilot plant and gas cleaning in TUDA

CLC experiments in a lab-scale reactor using ilmenite as oxygen carrier and wood pellets as feedstock show that packing enhances the fuel conversion, and increasing average CO₂ yield from 73.0% to 91.8% (RMSR) and 88.3% (ECA), compared to CLC experiments with no packing.



Layout of the 10 kW CLC unit at Chalmers with post-oxidation chamber and packings



Scheme of the 20 kW CLC unit at CSIC

Project number: 101147904

Duration: 48 months

EU funding: €3,948,500.00

Coordinator: Research Institutes of Sweden (RISE)

Project Coordinator: Amir Soleimani Salim



Website



LinkedIn



"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor CINEA can be held responsible for them."