

Negative emissions from waste and hydrogen-BECCUS

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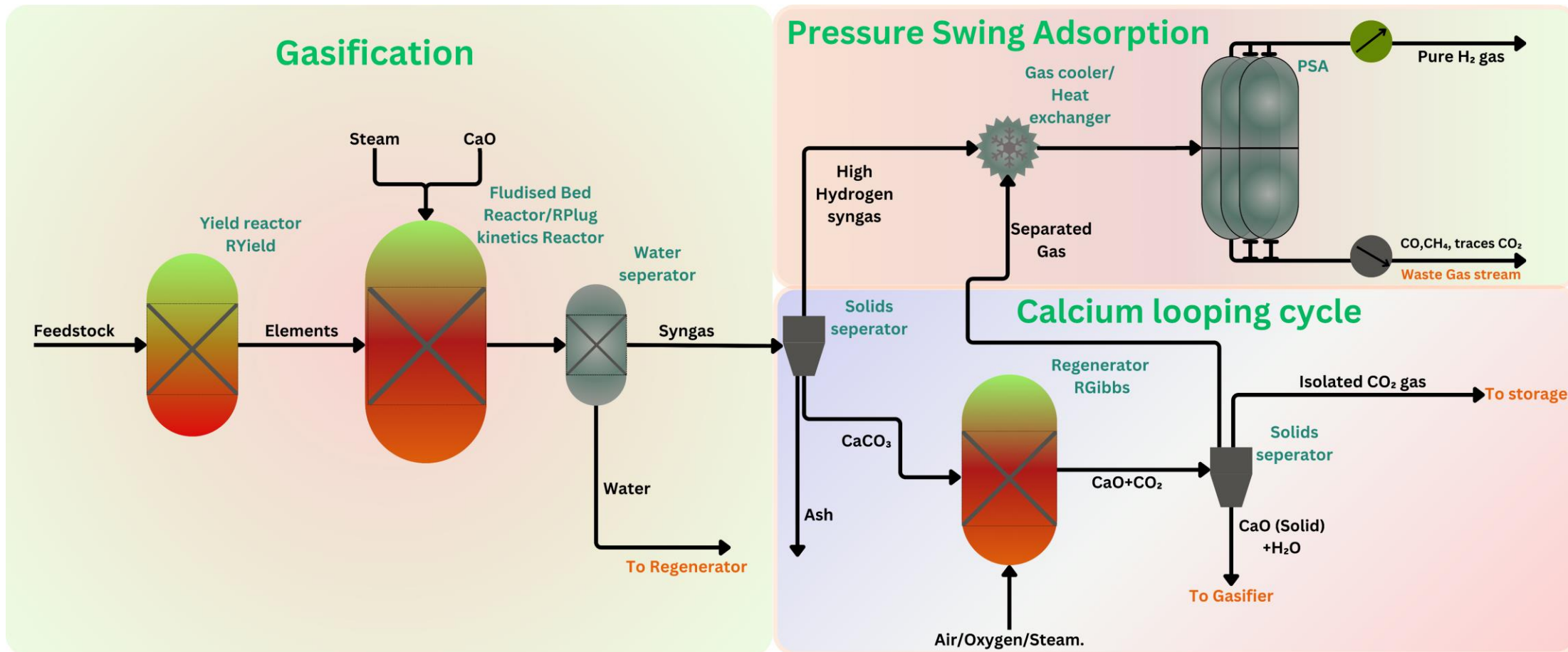
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<https://www.supergen-bioenergy.net/research/hydrogen-beccus/>

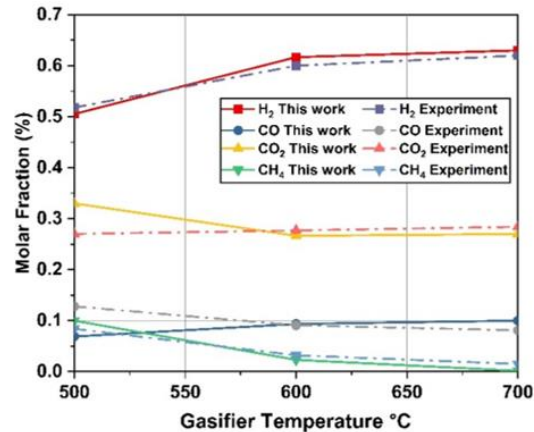
Develop an innovative hydrogen-BECCUS concept integrating robust thermochemical processes

- **Pyrolysis-assisted** gasification model with detailed tar kinetics, biosyngas upgrading and separation to optimise the yields of biosyngas/bio-H₂.
- **Various feedstocks** (municipal solid waste (MSW), biomass and agri-waste) will be tested through modelling and experimentation.
- Through a sensitivity study, an **optimum blend** will be determined for hydrogen-enriched biosyngas.
- Explore an efficient route for potential **sustainable aviation fuel (SAF)** from biosyngas.

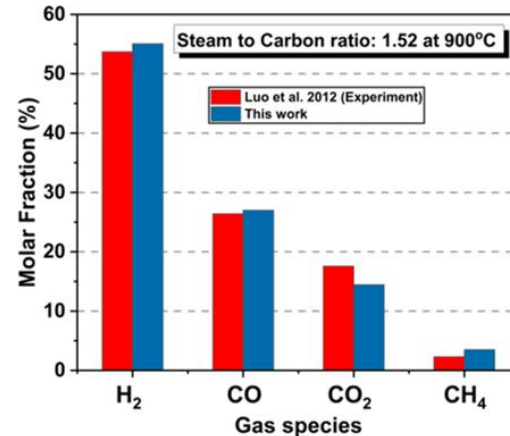
Integrated H₂-BECCUS Concept



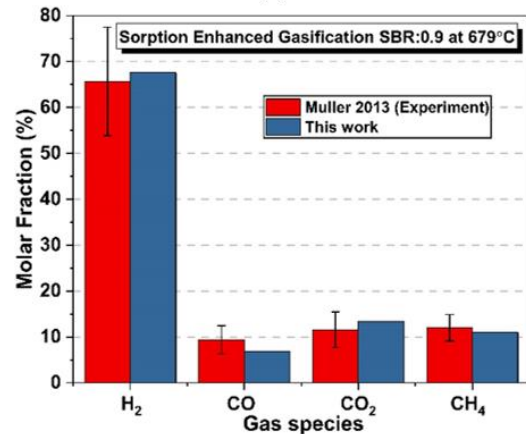
Model Validation (benchmark)



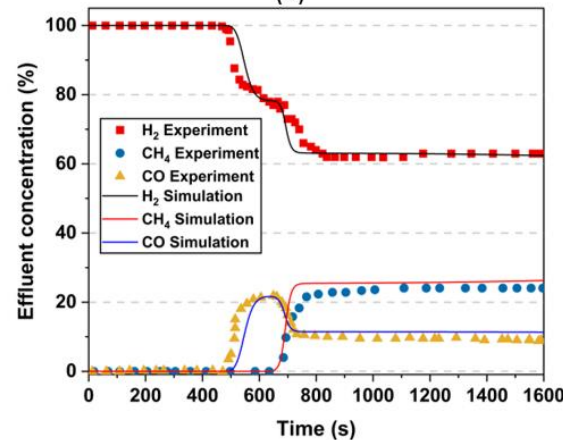
(a)



(b)



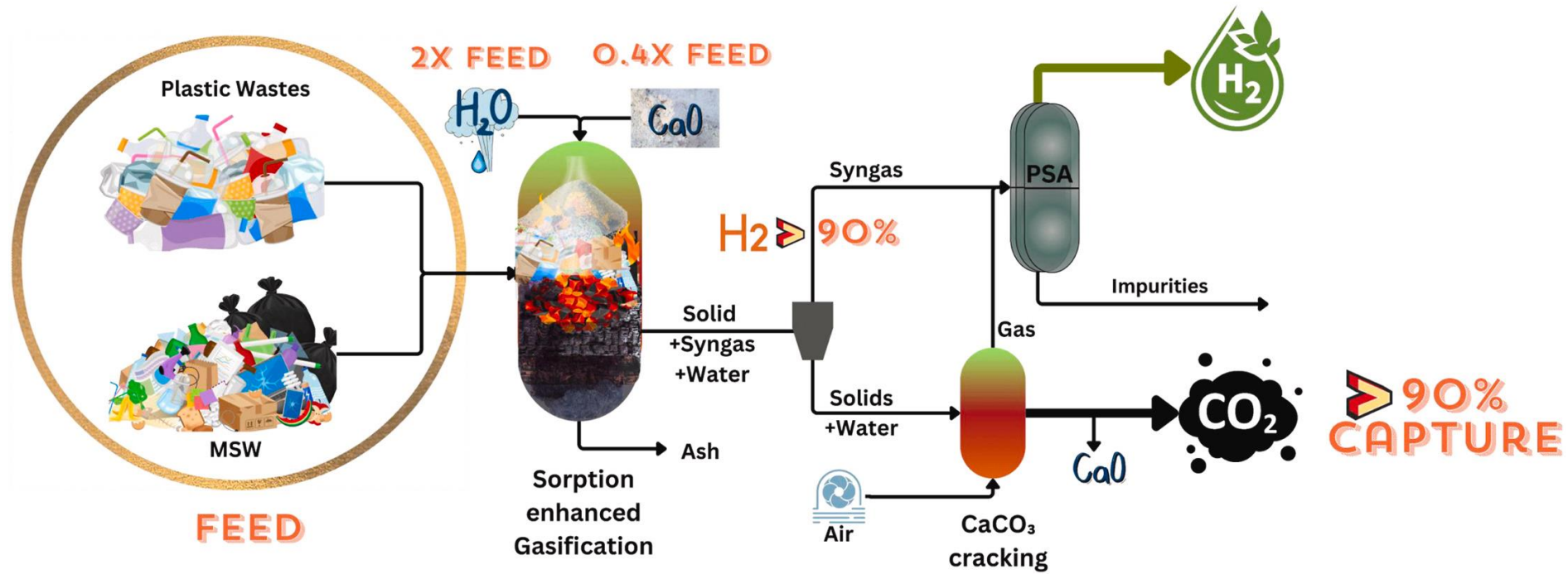
(c)



(d)

- System-level validation has been performed with benchmark studies.
- Influence of different feedstock, agents has been tested for robustness with more than 30 studies.
- Further modelling and validation is in progress for High Pressure gasification systems with Experimental Rig at Aston University

MSW H₂-BECCUS (Initial Results)



- BECCUS with steam gasification of a blend of feedstock with MSW
- 93% H₂ produced with 90% CO₂ in-situ captured



Waste to hydrogen: Steam gasification of municipal solid wastes with carbon capture for enhanced hydrogen production

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<https://doi.org/10.1016/j.biombioe.2025.107855>

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- **Validated Hydrogen-BECCUS Concept:** Demonstrated an integrated approach combining waste and biomass gasification with in-situ CO₂ capture — achieving up to 93% H₂ yield with 90% CO₂ captured.
- **Sustainable Pathway to Net-Negative Emissions:** Proven potential of BECCUS as a viable route for clean hydrogen, contributing meaningfully to the UK's net-zero strategy.
- **Future Outlook:** Ongoing techno-economic and LCA optimisation will refine process efficiency and scalability, strengthening the case for scale-up opportunity, de-risking investment for the development of future hydrogen-BECCUS system.

**Industry-Academia & Policy Forum Workshop for
Hydrogen BECCUS
March 2026**

