

1

Corrosion Measurements in Chemical Looping Combustion

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Public Workshop





Pilot tests - frame conditions and overview

LUISE

Pilot test: 1 MW_{th} CLC pilot plant TU Darmstadt Trial operation: almost 11 days

Oxygen carrier: Ilmenite

Fuel: SRF with 0.75 wt.% $_{tr}$ Cl, 0.2 wt.% $_{tr}$ S

Target temperatures > 900 °C in both reactors

Expectation: low load of corrosive species in the flue gas downstream the air reactor





Probes after Exposure





Details: Flue Gas Path Air Reactor: Microanalytic, Material Temperature about 510 °C





Details: Flue Gas Path Air Reactor: Microanalytic, Material Temperature about 290 °C and 90 °C



Potassium-Lead-Chlorides

Corrosion attack by chlorides

No sulphuric acid







Chemical Characteristics of Fly Ashes in the Flue Gas Paths behind the Reactors





Interim Conclusion

Findings do not meet expectations:

- \rightarrow Chlorine salts in the fly ashes and
- → Chlorine induced corrosion attack in all tested environments

... but what is the reason for this?











Conclusion

Target temperature > 900 °C should be maintained during the entire operating time in order to reduce the carryover of salts into the air reactor as much as possible

It is currently unclear what **potential for corrosion** and fouling would arise during regular operation. Potentially critical phases: CaCl₂, KCl, NaCl, KOH?, NaOH? + others?



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Low-cost CO₂ capture by chemical looping combustion of waste-derived fuels

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https://act-louise.net/

http://www.act-ccs.eu/