BEST
Bioenergy and
Sustainable Technologies



Recovery of Inorganics from Biomass Gasification

Bioenergy | Synthetic Biofuels | Biorefineries

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Topic

Advancing Gasification for Element Recovery

Developing and optimizing processes for recovering inorganic valuable materials from the gas phase and ash of biogenic residues. Experimental investigations are conducted at the 1 MW DFB steam gasifier, complemented by laboratory experiments and thermodynamic modeling. The aim is to enhance gas cleaning processes and close raw material cycles, contributing to the sustainable use of biogenic waste.

Scope

- **Feedstocks**
  Biogenic Residual Materials
- **Ashes**
  Chemical Analysis
- **Elemental Balance**
  Aggregation and Separation along the process chain
- **Phosphorus Recovery**
  Closing material cycles
- **Scrubber Systems**
  Optimization and regenerability
- **Thermodynamic Analysis**
  Ashes & Process Fluids
- **Experimental Campaigns**

Key Facts

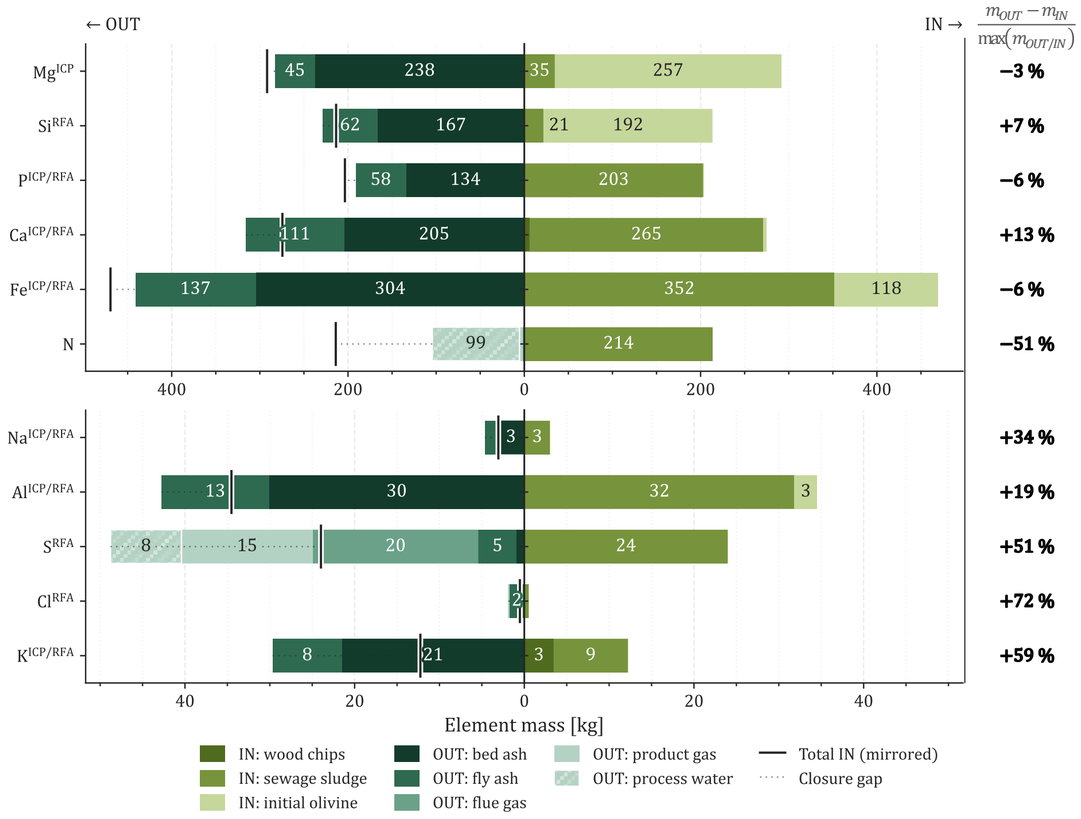
- **University:** TU Wien
- **Duration:** Jun 24 – Feb 28
- **Mentor:** Katharina FÜRSATZ
- **Supervisors:**
  Matthias KUBA
  Hermann HOFBAUER

Results

Sewage Sludge Bed Ash



2nd Sewage Sludge Campaign: 1MW Gasifier
The Mass- and Elemental Balances could be closed to +136 kg Ash closure error.



Process Water: mass found in collected process water of PG scrubbers.
Product Gas: describes the cleaned gas after the scrubbers.

Elemental Balance: Based on RFA and ICP-OES measurement

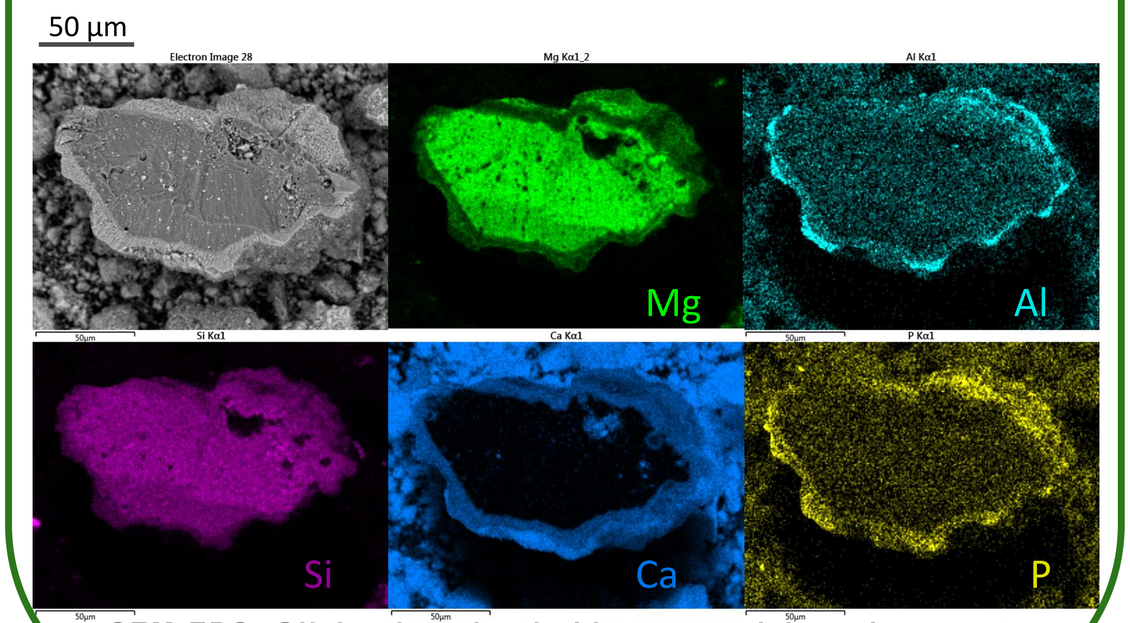
Gas Scrubbing / Water-RME-Emulsion:

- Temperature accelerates RME chemical ageing which is enabled by pH-derivations from neutral.
- pH-Value dominates emulsion separation behaviour.

$$RCOOCH_3 \begin{matrix} + NaOH \rightharpoonup RCOO^-Na^+ + CH_3OH \\ + H_3O^+ \leftrightharpoons RCOOH + CH_3OH \end{matrix}$$

saponification (top) and hydrolysis (bottom)

Sorption Enhanced Gasification: SEM-EDS:
At a research stay in Luleå the Limestone rich fractions of the SEG campaign were screened.



SEM-EDS: Olivine-layering in Limestone rich environment

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