

Chemical Looping Gasification (CLG) Technology of Biomass and Oil Shale

Summary

The Department of Energy Technology at Tallinn University of Technology is seeking a highly motivated and dedicated PhD candidate to join our research team. The successful applicant will work on a cutting-edge project focused on Chemical Looping Gasification (CLG) Technology of Biomass and Oil Shale

Research field:	Chemical, materials and energy technology
Supervisors:	Prof. Dr. Alar Konist Dr. Mai Uibu
Availability:	This position is available.
Offered by:	School of Engineering Department of Energy Technology
Application deadline:	Applications are accepted between January 01, 2025 00:00 and January 24, 2025 23:59 (Europe/Zurich)

Description

Chemical Looping Gasification (CLG) Technology

As a PhD researcher at TalTech, you will contribute to cutting-edge research in Chemical Looping Gasification (CLG) technology. Your work will focus on utilizing both biomass and oil shale as primary feedstocks for CLG studies. Specifically, you will investigate the behavior of these feedstocks during initial runs using Thermogravimetric Analysis (TGA) and Batch Reactors. This position offers a unique opportunity to advance sustainable energy solutions and contribute to the field of renewable fuels.

Research Background: Biomass and Oil Shale-Based CLG Technology

1. Biomass and Oil Shale as Renewable Resources

- **Biomass:** Derived from organic materials such as wood, agricultural residues, and algae, biomass represents a promising renewable resource for energy production. Unlike fossil fuels, biomass is sustainable and reduces greenhouse gas emissions.
- **Oil Shale:** Oil shale is a sedimentary rock rich in organic matter. It contains kerogen, which can be converted into liquid hydrocarbons through processes like pyrolysis and gasification.

2. Chemical Looping Gasification (CLG)

CLG technology involves converting feedstocks into valuable products through controlled reactions. Here are the key aspects of CLG:

- **Gasification:** In chemical looping gasification, feedstocks react with a solid oxygen carrier (usually a metal oxide) in the absence of air. The oxygen carrier provides oxygen to the feedstock, resulting in the production of syngas (a mixture of hydrogen, carbon monoxide, and other gases).
- **Advantages of CLG:** CLG offers several advantages, including improved process efficiency, reduced emissions, and the ability to use a variety of feedstocks.

3. Experimental Approach

Your research will involve the following steps:

1. Thermogravimetric Analysis (TGA):

- TGA measures the weight loss of a sample as it is heated under controlled conditions. By analyzing the weight loss profile, you'll gain insights into the thermal behavior of biomass and oil shale during heating.
- Investigate the decomposition kinetics of biomass and oil shale components using TGA.

2. Batch Reactor Studies:

- Conduct experiments in batch reactors to simulate the gasification process.
- Evaluate the effects of different oxygen carriers, temperatures, and reaction times on feedstock conversion.
- Monitor product yields, selectivity, and overall process efficiency.

Applicants should fulfil the following requirements:

- A master's degree in thermal, chemical or mechanical engineering
- Good speaking and writing English.
- a clear interest in the topic of the position
- strong and demonstrable writing and analytical skills
- capacity to work both as an independent researcher and as part of an international team
- capacity and willingness to provide assistance in organizational tasks relevant to the project

(The following experience is beneficial:)

- Knowing power plant DHS
- Practical experience with XRD, TGA, etc analysis
- Previous participation in research projects



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