Internship/Master Thesis

Biomass ash production from combustion in a bench-scale boiler

BACKGROUND:

Ashes produced from combustion of biomass fuels have the potential to contribute to cement production as an alternative and sustainable binder. However, non-woody biomass fuels are often characterized by a higher tendency for slag formation and ash handling problems during the combustion process [1]. In addition, the ash quality can vary because of the heterogeneous nature of the biomass fuels. In this respect, the ongoing project (BioBeton) focuses on the production of the ash from different untreated and chemically pre-treated biomass fuels. Kaolinite will also be used as an additive for selected fuels to mitigate slag formation during the combustion. Combustion performance of some biomass fuels have already been investigated in lab-scale experiments using a muffle furnace. In the current investigation, the applicant will perform combustion tests of the selected fuels on bench-scale using a boiler with a nominal heat capacity of 49 kW to produce ashes that are suitable as binders for cement production. Furthermore, slag formation tendency of the produced ashes will be analyzed using different analysis methods [2]. Then, selected ash samples will be characterized using STA-FTIR-QMS, gas sorption, etc. Finally, reactivity of the produced ashes for cement production will be analyzed using standardized methods [3-4].

YOUR TASKS:

- Evaluation of the state of knowledge for biomass ash behavior during combustion.
- Performing combustion tests in the biomass boiler.
- Ash characterization.
- Analysis of reactivity using standardized methods.

YOU HAVE:

- Academic background in mechanical or chemical engineering, chemistry and material sciences or comparable with experience in thermochemical conversion of biomass.
- English language proficiency. German language skills are beneficial.

WE OFFER:

- Advanced experimental and research facility.
- A good introduction to the topic as well as competent and motivated scientific support in the processing of the tasks.
- A family-friendly, modern working environment in a collegial working atmosphere.
- Good public transport connections.
- A collaborative work experience with renowned research groups in the presented topic.

REFERENCES:

[1] Beidaghy Dizaji H, Zeng T, Hölzig H, Bauer J, Klöß G, Enke D. Ash transformation mechanism during combustion of rice husk and rice straw. Fuel (2022) 307:121768. https://doi.org/10.1016/j.fuel.2021.121768.

[2] Beidaghy Dizaji H, Zeng T, Enke D. New fuel indexes to predict ash behavior for biogenic silica production. Fuel (2022) 310 PB:122345. https://doi.org/10.1016/j.fuel.2021.122345.

[3] Li X et al. Reactivity tests for supplementary cementitious materials: RILEM TC 267-TRM phase 1, Material and Structures (2018) 51:151. https://doi.org/10.1617/s11527-018-1269-x.

[4] American Society for Testing and Materials (ASTM), C1897 – 20, Standard test methods for measuring the reactivity of supplementary cementitious materials by isothermal calorimetry and bound water measurements, 2020. http://doi.10.1520/C1897-20.

BEGINNING:

01.04.2022

DURATION:

2-6 months

LANGUAGE:

English

PROCESSING LOCATION:

Deutsches Biomasseforschungszentrum, Torgauer Straße 116, 04347 Leipzig

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APPLICATION DOCUMENTS:

Please submit your compelling application (in a single attachment, preferably as pdf, max. 5 MB)

e-Mail: bewerbung@dbfz.de

For an encrypted transmission of your application you can use the upload form Cryptshare.
www.dbfz.de/stellen