Thermogravimetric Analysis (TGA) of materials for CO₂ capture using calcium looping

(After consultation with the supervisor, the scope can be adapted for a master’s or student research project.)

Background

Over 40% of global CO₂ emissions are caused by power generation in fossil-fired power plants. CCS (Carbon Capture and Storage) technologies can be effectively integrated into existing power plants and can lead to CO₂ emission reductions of up to 90%.

Depending on the application, different materials are used to capture the CO₂ contained in the flue gas. At the IFK, the CCS technology Calcium Looping (CaL) is being investigated among others. The advantages of CaL for power plant and industrial applications are, that the required heat for CO₂ capture is mostly present and the required limestone (CaCO₃) is an inexpensive sorbent. The differences in the Ca-based sorbents for CO₂ capture shall be investigated in this work.

Process

The calcium looping process (CaL) is based on the cyclic calcination and carbonation (CaCO₃ ⇌ CaO + CO₂) of a calcium-containing sorbent. After CO₂ uptake, the resulting CaCO₃ must be regenerated again, which is done by means of oxy-fuel calcination at high temperatures (850 - 950°C). These reactions will be carried out with different materials by thermogravimetric analysis. With the help of this laboratory device, the uptake and release of CO₂ with the sorbent can be easily understood.

Approach and tasks

1. Literature review and familiarization with the topic
2. Conduction of TGA experiments
3. Analysis of the experimental data
4. Writing of thesis (German or English)

Requirements

- Interested in CCS-Technologies
- Interested in experimental work in a laboratory scale
- Knowledge in data analysis (Excel, Python) desirable

Start date: immediately!

A student assistant job may be offered.

Interested students please contact

M.Eng. Nico Mader Tel. 0711/685 65584
Dept. Decentralized Energy Conversion E-Mail: nico.mader@ifk.uni-stuttgart.de