

BEST / BE2020_2.0/BIO-LOOP

BEST – Bioenergy and Sustainable Technologies GmbH / BIOENERGY 2020 / Chemical Looping for efficient biomass utilisation

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET Module

Type of project: BIO-LOOP, 04/2020-03/2024, multi-firm

BIO-LOOP



THE RIGHT MATERIAL FOR NEGATIVE CO₂ EMISSIONS

THE AIM OF THE BIO-LOOP PROJECT IS TO PRODUCE ENERGY FROM BIOMASS, WHILE INDIRECTLY REMOVING CARBON DIOXIDE FROM THE ATMOSPHERE. THE PROJECT TEAM SEARCHES FOR AN IDEAL OXYGEN CARRIER FOR CHEMICAL LOOPING COMBUSTION TO ACHIEVE THIS AIM.

Biomass is considered a CO₂ neutral energy source and is already being used to reduce greenhouse gas emissions, since the CO₂ released during combustion is absorbed from the atmosphere through photosynthesis during plant growth. Chemical looping (CL) represents a novel technology, where the oxygen required for the combustion (and also gasification) of biomass is provided by a solid oxygen carrier. The resulting CO₂ can then be removed in a simple and cost-effective process and used as a valuable resource for further processing.

This CO₂ negative emission technology thus makes a substantial contribution to the fight against global warming.

The oxygen carrier represents the key element of the chemical looping technology. Numerous analyses and experiments have been carried out as part of the BIO-LOOP project to identify the most important properties of oxygen carriers and the requirements they need to fulfil. These investigations helped to provide a clearer picture of their specifications and also resulted in the development of methods for assessing and comparing the different materials. This makes it possible to quickly assess the suitability of different metal oxides – be they natural ores or synthetic materials – for use as oxygen carriers.

SUCCESS STORY



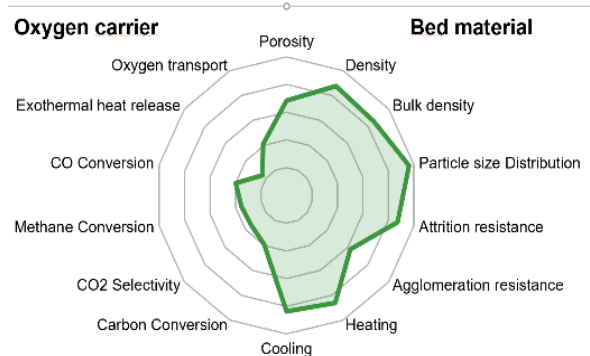
Properties of oxygen carriers

In addition to environmental sustainability and costs, the materials investigated were experimentally evaluated based on two categories of key properties:

- specific oxygen carrier properties
- general bed material properties.

Only those materials that score top values in both categories provide an ideal oxygen carrier for use in chemical looping. The materials can be compared using so-called spider charts, where the area within the line directly reflects the material's suitability. The potential of each oxygen carrier is assessed prior to carrying out extensive experimental runs in a large-scale plant. Moreover, the reaction speed of the carrier material is measured using specific analysis tools in order to be able to model and simulate its behaviour in large-scale operation. The design can thus be optimised in advance, ensuring high efficiency in real-world deployment.

Fluidized bed CLC



© TU Wien, evaluation of ilmenite as an oxygen carrier

Impact and effects

The findings from this research project are expected to substantially accelerate the identification of suitable materials and thus the progress of the chemical looping combustion technology. This is of great importance in the fight against climate change, and it comes not a day too soon.

Project coordination (Story)

Dr.-Ing. Kai Schulze
Area Manager Modelling & Simulation
BEST
T +43 (0) 50 2378 - 9232
kai.schulze@best-research.eu

BEST (Operating organisation/ Consortium Lead)

Inffeldgasse 21b
8010 Graz
T +43 (0) 50 2378-9201
office@best-research.eu
www.best-research.eu

Project partners:

- TU Graz (ITE, CEET)
- TU Wien
- NIC Ljubljana
- SCIC Spain
- Chalmers University of Technology
- Aichernig Engineering GmbH
- AVL List GmbH
- Christof Industries Austria GmbH
- Rouge H2 Engineering GmbH
- SW-Energie Technik GmbH
- TG Mess-, Steuer- und Regeltechnik GmbH
- Rohkraft- Ing. Karl Pfehl GmbH

This success story was provided by the consortium leader and the mentioned project partners for the purpose of being published on the FFG website. The BIO-LOOP COMET Module receives funding from BMK, BMDW and the regional government of Styria under the COMET – Competence Centers for Excellent Technologies Programme. The COMET Programme is managed by FFG. Further information on COMET: www.ffg.at/comet