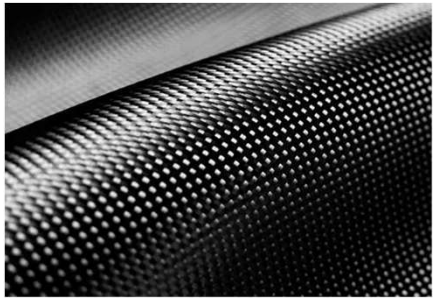
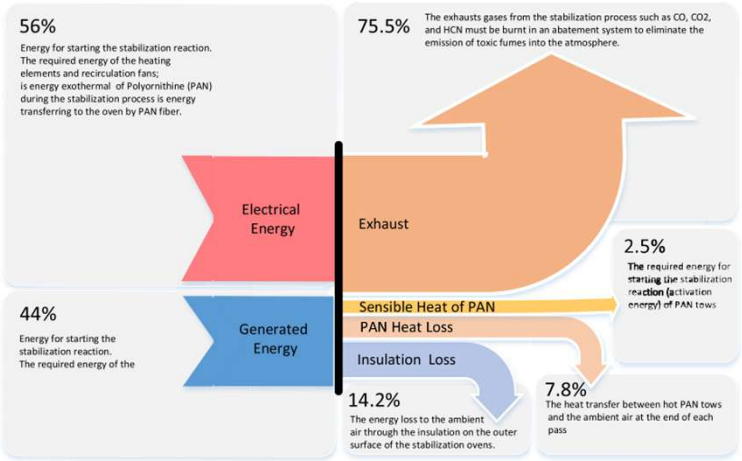
Comparative Life Cycle Assessment (LCA) of Biobased and Conventional Carbon Fibres



Source: Murtfeldt Kunststoffe



Source: Khayyam et al., Improving energy efficiency of carbon fiber manufacturing through waste heat recovery: A circular economy approach with machine learning, E 225, 2021.

Description

For the production of lightweight high-pressure tanks for hydrogen in mobility applications, the use of the high-performance material carbon fibres is essential. Conventional carbon fibres are produced from fossil precursors such as polyacrylonitrile (PAN) and require high heat and energy input during production. A possible alternative is the production of carbon fibres from biobased raw materials. In order to investigate the sustainability of this alternative production method, the raw material and energy consumption of both production processes must be compared.

The aim of this work is to carry out a comparative life cycle analysis (LCA) according to ISO 14040/ISO 14044 for the conversion of a fossil precursor (PAN) and a biobased precursor (viscose) to carbon fibres (CF) by fibre preparation, stabilisation, and carbonization. Detailed experimental data for the precursor conversion to carbon fibres is available from project partners, data for precursor production is to be taken from literature.

The LCA is to consider cradle-to-gate, i.e. the environmental impacts of a product's life cycle from raw material extraction (cradle) to the factory gate, excluding usage and end-of-life stages.

Content

- Familiarization with creation of LCAs, relevant standards (e. g. ISO 14040, ISO 14044), software (e.g. *openLCA*), and databases
- Detailed mapping of the carbon fiber production process, incl. energy and material flows and system boundaries
- Determination and comparison of process data
- Preparation of LCA and written thesis

Start: as of now

Duration: approximately 6 months

Paid Master Thesis

Contact: Dr. Wolfgang Siegl
+43 316 873 9497, siegl@hycenta.at
Dr. Franz Winkler
+43 316 873 9887, winkler@hycenta.at