LIFE CYCLE ASSESSMENT OF LIGNIN BASED CARBON FIBRES

-Future environmental opportunities

Carbon fibres are usually made from polyacrylonitrile, PAN, a fossil-based polymer. Research has shown that a possible route to reduce the environmental impact from carbon fibres is to replace PAN with a bio-based alternative, such as lignin. Lignin is a main by-product of many biorefinery processes that use ligno-cellulosic material as feedstock.

The goal of the study was to compare future environmental impacts of orbital launch rockets of today's predominant technology with those of carbon fibres made from lignin and polymer blend. The relationship between light and energy use could decrease the environmental impact of the carbon fibres.

RESULTS

Strongly fossil based electricity mix
Represented by German electricity mix

Strongly non-carbon electricity mix
Represented by Swedish electricity mix

CONCLUSIONS

- Lignin-based carbon fibres could in the future have a lower climate impact and energy use compared to today’s PAN-based carbon fibres.
- The choice of electricity mix has a large effect on the climate impact of the carbon fibres.

FURTHER FUTURE IMPROVEMENTS

- The use of plasma technology in carbonization could decrease the energy use further.
- Increasing the share of lignin in the precursor fibre could also decrease the environmental impact of the carbon fibre.

REFERENCES


ACKNOWLEDGEMENT

This study was carried out as a part of the LIBRE (Lignin Based Carbon Fibres for Composites) project, which has received funding from the Bio Based Industries Joint Undertaking under the European Union’s Horizon 2020 research and innovation program under grant agreement No 720707.