Title: Bio based carbon fibre and polymers - feedstock sourcing outlook

Problem statement

Composite materials are increasingly used in aerospace industry. Especially carbon fibre composites offer many opportunities for saving weight and thereby fuel. The carbon fibres and high-performance polymers used to create these composites can be produced from a variety of feedstocks. Currently, these are mostly fossil-based, but we are interested in using bio-sourced, renewable and cyclic feedstocks. These include natural fibres, bio-based resins and production of carbon fibres based on bio-sourced precursors.

When investigating these alternative pathways we need to consider the materials performance, which should be at the desired level for aerospace products, while becoming more sustainable. The proposed sourcing pathways are of different nature and fulfil the challenging targets differently. In order to assess them properly, life-cycle analysis results and methodologies have to be understood and ways for interpretation established. In addition these results need to be linked to economic considerations originating from e.g. the total level of availability or the competitive situation with other envisaged users. Moreover, using alternative resources may cause unintended consequences. For example, biobased feedstock (or the land needed to grow it) may compete with food production.

Finally using such alternative feedstock supplies will only become reality based on specific ideas and solutions. For example, when considering algae as feedstock: what would algae-based supply chains look like? Where would the algae be produced?

Research question(s)

What will be the projected environmental impact scenarios following alternative routes for producing carbon fibre or high performance polymers? Could a specific demand be realized? What could be time horizons? How could such supply chains look like? What could be the price of such feedstock? What could be competing user scenarios?

Expected type of work

1. Understanding and evaluating new and known pathways through e.g. material flow analysis or life cycle analysis
2. Closing existing practical gaps with creative and unconventional solutions; developing supply chains based on alternative feedstock sources
3. Work and think about the challenge as an entrepreneur!

References

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Commissioner details

Organization / Department: Airbus
Name: Uwe Beier, Caroline Petiot, Christian Weimer
Email: uwe.beier@airbus.com; caroline.petiot@airbus.com, christian.weimer@airbus.com