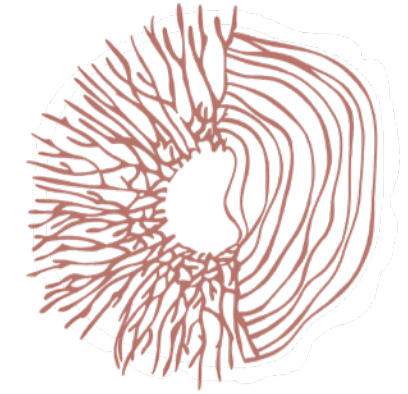


Designing Bio-based Materials for Lightweight Aircraft Seating and Engineering them to meet the Functionality Requirements



Eco-Nest

Project Context:

Airbus Cabin Vision 2035 aims to transform the future experience of air travel with a focus on sustainability through its three pillars: Transparency, Decarbonization, and Circularity (Airbus, Airspace Cabin Vision 2035+). As part of this initiative, the current thesis explores the potential of bio-based materials to replace conventional fossil-based thermoplastics in aircraft seating trims. By investigating whether nature can provide lighter and environmentally friendly alternatives, this study seeks to reduce the aviation industry's carbon footprint (during the usage phase of aircraft) while enhancing the circularity of the materials.

Project Method:

This research is structured in a three-phase iterative framework. The initial phase involves problem analysis and the development of design specifications. The next phase, material exploration followed by Lightweighting method.

Results:

The proposed design is a composite with facesheet made of Buxus Sinica, pre-treated with hydrogen peroxide, sodium hydroxide, and sodium silicate, resulting in a material that is both self-extinguishing and possesses a hydrophobic surface which are critical requirements of an aircraft cabin component. The mycelium core is also treated with sodium silicate, further enhancing its flame-resistant properties. Mycelium is cultivated on a textile stretched across the fabric using rivets, thereby eliminating the need for adhesives, such as epoxies, to bind the core and the face sheet.

Positioned within the framework of Circular R-strategies, this study proposes an ambitious design, utilizing a wood and mycelium to develop a composite, with textile serving as the adhesive layer. The proposed design not only consider the circularity of the materials but also reduces weight by up to 50% compared to conventional thermoplastics in seat trims. This weight reduction is significant, as even a single kilogram less can lead to a decrease of 5,000 to 15,000 kg CO2 emissions over the aircraft's lifetime!

Ideally upto **50% lighter** than the thermoplastics (ABS+PC) for the same load bearing capacity

Facesheet and the core material exhibit **satisfactory flame retardant properties**

Completely **Biodegradable**

No fossil based materials used

Circular Product



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