From guitar to Automotive

By Alex Thielen

Lingrove, the San Francisco, USA, based biocomposite manufacturer has set its eyes on the automotive market with their flagship material Ekoa® Surface. Originally developed as a lightweight alternative to rainforest wood for guitars, Ekoa has been adapted to many applications from fishing rods to arrows, but has recently been applied to interior applications in cooperation with some of the largest commercial interiors companies in the world. And while the commercial interiors market is still very central to Lingrove's future plans with furniture applications due next year, the automotive sector also offers a range of near-term opportunities.

Ekoa is made from flax fibre, the strongest and stiffest natural fibre, which is already produced on an industrial scale, is CO_2-negative, and requires no irrigation.

Using flax fibres for car interior parts is not exactly a new groundbreaking idea but Joe Luttwak, Lingrove founder and president, only sees this as the first step of many, due to the specific properties Ekoa offers.

"Ekoa uses flax, but that is only part of the recipe as Ekoa is not a material but both a structural and decorative composite product – all-in-one. Ekoa is the finished, show surface on a moulded part or panel with both the look and strength derived from high-performance plant inputs. We use flax today because of its exceptional stiffness, though our flexible platform allows for the use of many fibres in the future. Natural composites can have a higher specific modulus than E-glass and exhibit excellent strength-to-weight properties for auto applications. Meanwhile, carbon fibre has 90 times the embodied carbon (carbon footprint, or total greenhouse gases released throughout the supply chain) compared to flax fibre."

Lingrove's Ekoa Surfaces have up to 98% biobased content and are Clean Air Gold certified. Ekoa Surface is still undergoing a life cycle analysis which is projected to be carbon negative. And while sustainability is certainly one driving factor in the adaptation of natural fibres, it is by far not the only factor. Ekoa is lighter than carbon fibre, stiffer than fibreglass, and visco-elastic which means it doesn't fail catastrophically – it bends before breaking unlike e.g., carbon fibre. Its main advantages over other materials are its mouldability and lightweighting, which could lead to better and more fuel-efficient vehicles. Luttwak sees opportunities to not just replace wood or conventional fibres, but plastics and metal parts as well.

"This is a new class of composites materials and because they are rapidly renewable have the chance to compete price-wise with energy embodied, extractive materials, often for higher-margin interior applications such as panels, seating, and floors. Eventually, as production scales, we see body panels and eventually even the unibody," says Luttwak, "Ekoa can also accommodate geometry required of metal parts. Our tests suggest that Ekoa can be both stronger (tensile strength) and stiffer (tensile modulus) than aluminium, for instance, which means the entire vehicle is possible. Being able to mould into complex shapes is part of the way to achieve lower mass, regardless of the material used. While this concept of the biobased car structure is still in early development, I see Ekoa as a key solution to bringing down embodied carbon across mobility and eventually the built environment by replacing plastics, metals, and conventional composites."

Luttwak has a background in the automotive industry having worked for Ferrari early in his career, he knows the high requirements this sector demands firsthand, but is also aware of the need for more sustainable solutions. He notes that 20% of CO_2 emissions for the automotive industry comes from producing the car alone, a vehicle made almost entirely of Ekoa would be able to cut a major portion of this 20 %. If that will be actually possible remains to be seen. However, Lingrove has made its first steps towards that vision, are in pilots with Tier 1 automotive suppliers and automotive companies in North America, Europe and Asia, and have received their first purchase order from a U.S. automotive OEM for an aesthetic lightweighting application in late 2020. And they have further orders from a few other Tier 1 suppliers since then. These applications are targeted for 2023 production models. It will take quite a bit longer until we can hope to see a whole Ekoa car, but to end with Luttwak's optimistic words about his material, "the possibilities are endless."

https://lingrove.com/surface/auto

	Ekoa	Premium Wood	Aluminium 6061	Carbon laminate	Aircraft 'E-Glass'
Form	Film, Panel	Blanks	Sheet	Roll	Roll
Density (g/m³)	1.13	0.5-0.08	2.7	1.7	2.6
Tensile strenght (MPa) ASTM D30393	377	Highly variable	310	1800	1500
Tensile Modulus (MPa) ASTM D3039	34	Highly variable	70	135	32
Cost	$$	$$$	$	$$$	$$

How Ekoa compares (Source Lingrove)

Lexus interieur (Source Lingrove)