ESBBC Summer School Cambridge 2025

Bio-composites for wind energy applications

Focus on damping and nonlinear behaviors

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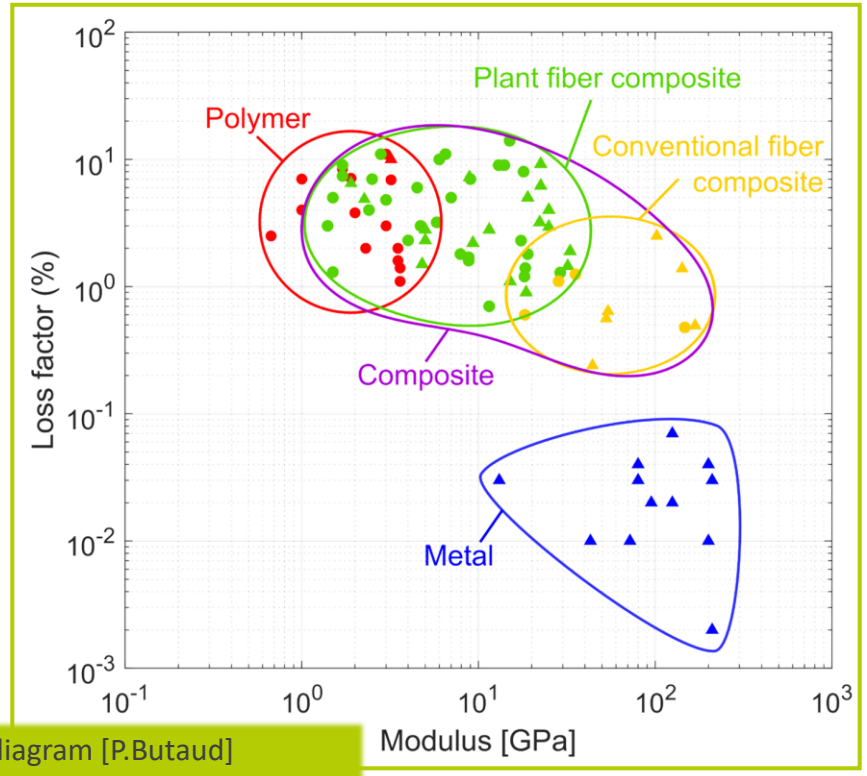
SSUCHY-Next:
Focus on damping & nonlinearities
(WP3, SSUCHY-Next)

This project has received funding from the Circular Bio-based Europe Joint Undertaking (CBE JU) under grant agreement No 101157517.
The JU receives support from the European Union Horizon Europe research and innovation programme and the Bio Based Industries Consortium.

Towards Sustainable and High-Performance Composites

Combining environmental responsibility with functional performance



Ashby diagram [P.Butaud]
Loss-modulus map from literature

Plant fibers: a key lever to balance damping and stiffness

Objectives

⇒ Improving **structural damping** and the **stiffness-to-damping compromise** of bio-based composites

⇒ Considering **material damping** and **nonlinear behavior** in the design of structures such as **wind turbine blades**

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Damping sources

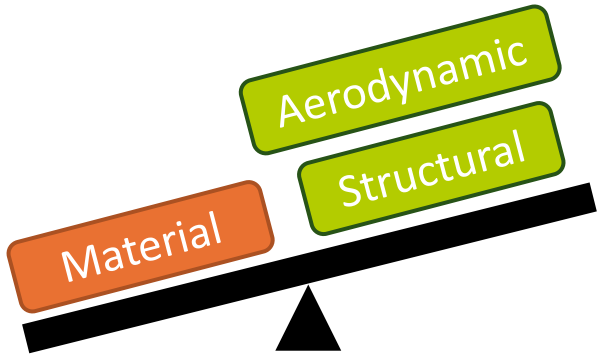
Structural

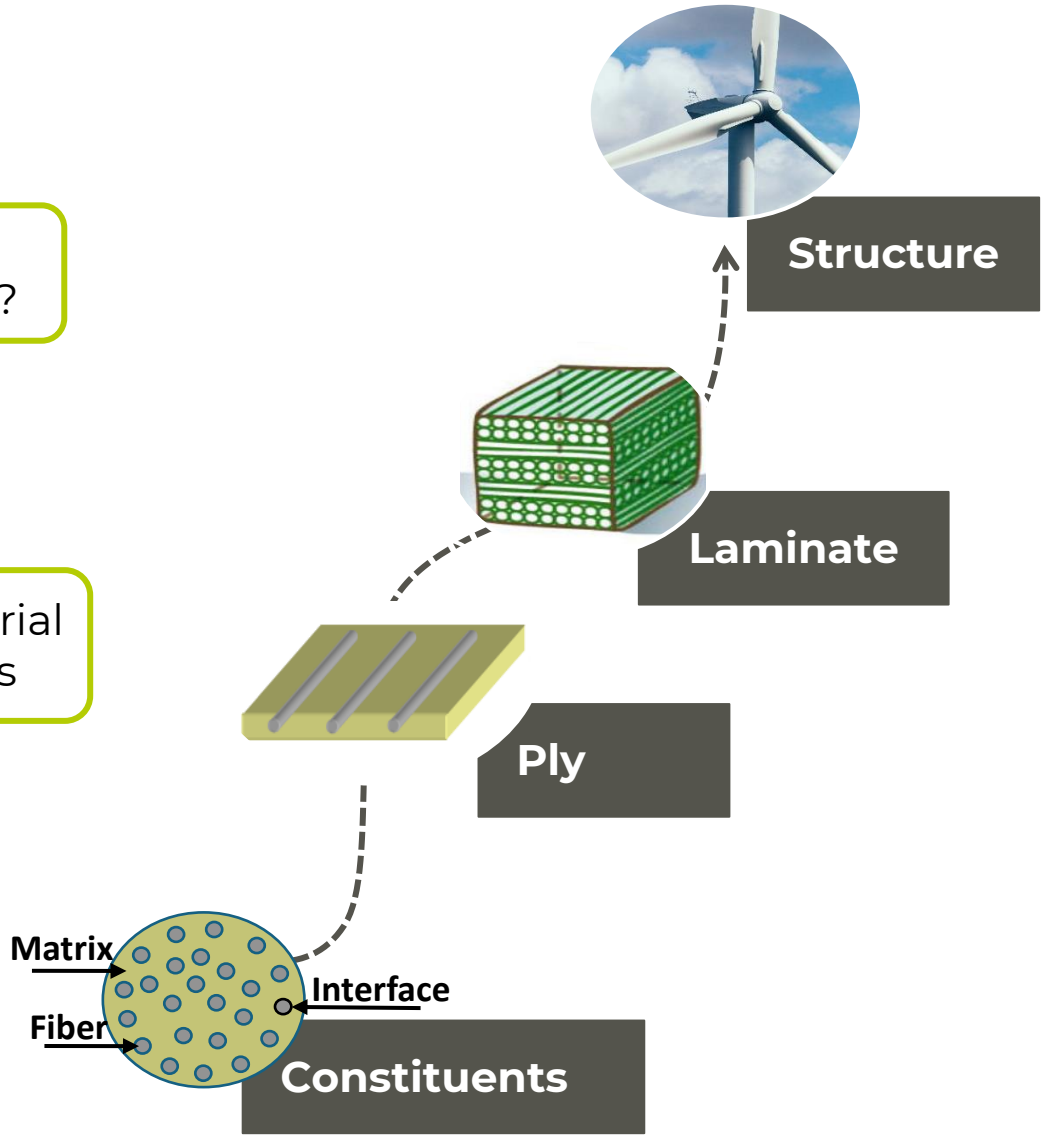
Aerodynamic

What is the part of material damping in the global damping ?

Material

Need a model to include material damping in the design of blades





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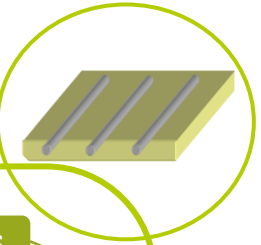
Elastic and damping properties identification

Blade prototype



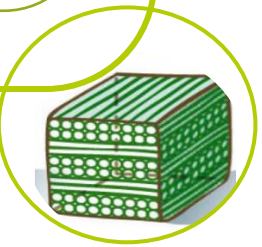
Vibration tests

Eigenfrequencies ω_j
Modal damping ξ_j
Complex eigenfrequencies

DMA tensile tests

FEMU

Viala et al. 2018



Identified properties

$E_x, E_y, G_{xy},$
ν_{xy}, ν_{yx}
$\eta_x, \eta_y, \eta_{xy}$

y
x

Elastic and damping properties

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First results of composite identification

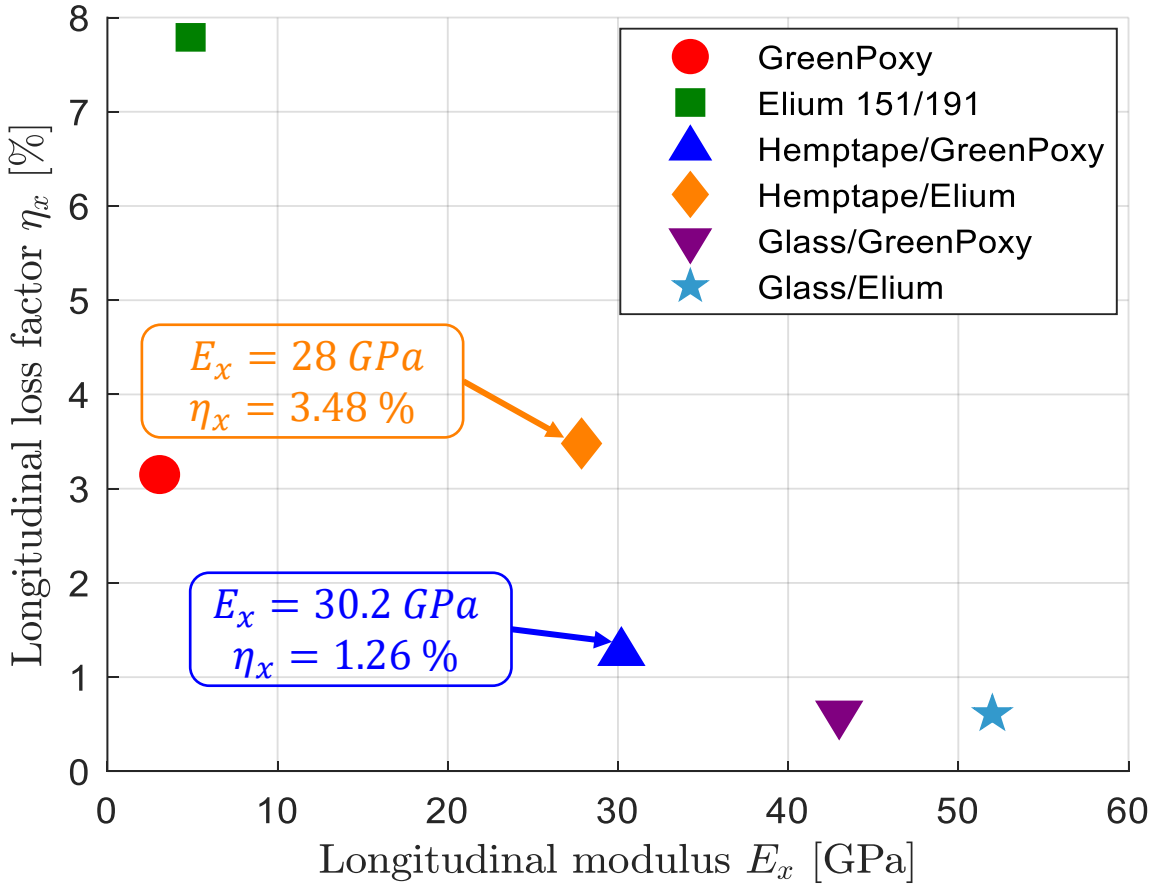
How the properties of newly developed constituents can improve / influence the behavior of a complex structure?

Fibers

Resin

GreenPoxy®

ARKEMA ELIUM®



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THANK YOU FOR YOUR ATTENTION

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