

Job title	Optimization, fabrication and characterization of wood/natural fiber composite hybrid laminates
Job type (PhD, Post-doc, Engineer)	PhD
Contract duration (months)	36 months
Qualifications (Master degree, PhD...)	Master degree in Mechanical Engineering
Job hours (full time/ part time)	Full time
Employer	UBFC
Host Laboratory	DRIVE (main location) FEMTO-ST
URL Host Laboratory	drive.u-bourgogne.fr www.femto-st.fr
Address Host Laboratory	LABORATOIRE DRIVE - 49, rue Mademoiselle Bourgeois - 58 000 NEVERS INSTITUT FEMTO-ST – DÉPARTEMENT MECANIQUE APPLIQUÉE 24 Chemin de l'Épitaphe - 25000 BESANÇON
Job description	<p>Framework of the project</p> <p>The PhD is part of the transverse project WooFHi (Wood/natural Fiber High homogeneity/performance composite) carried by three laboratories of Bourgogne Franche-Comté (LaBoMap - Cluny, FEMTO-ST - Besançon, DRIVE - Nevers). This project aims at optimizing and homogenizing heterogeneous and variable wood-based materials by layering and hybridization with natural fiber composites. The targeted structural applications concern the transport field.</p> <p>Context</p> <p>One of the methods to better control the mechanical properties of wooden structures is to use reconstituted materials, such as CLT (Cross Laminated Timber) or LVL (Laminated Veneer Lumber). In the latter case, thin layers of wood (veneers) are obtained by peeling a log, and assembled to obtain homogenized properties. But even in this case, the mechanical performance remains very variable compared to synthetic materials, and their use requires high safety factors. This limits their applicability in fields such as transport where the dimensioning must be done as accurately as possible in terms of weight/volume.</p>

	<p>The reinforcement of wood by organic matrix composites is a solution to improve and homogenize further the characteristics of this material. Studies using glass or carbon fibers have already been carried out, but the use of natural fibers (such as flax or hemp) seems more appropriate when the minimization of the environmental footprint of the solution is of prime concern. This association of wood and natural fiber composites should also allow the use and valorization of local wood of secondary quality and variable properties by controlling in a methodical way the structuring of the hybrids to obtain homogeneous final properties.</p> <p>Provisional work program</p> <p>The first part of the work will concern the development of the process of elaboration of the hybrid materials themselves, beginning with the selection of the constituents and the assembly method. The exploration will concern the wood species, the types of natural fibers as well as the matrices (thermoplastic resulting from recycling, or biosourced thermoset polymers). The structuring of the laminates will take into account the characteristics of the wood plies (mapping of local fiber orientation) in order to obtain homogeneous target properties by adding composite plies. The hybrid materials developed will then be characterized physically and mechanically (static and dynamic/vibrational properties), in order to estimate their variability and the relevance of predictive models. Finally, we will study the effect of aging (humidity, temperature, UV...) on a range of physical and mechanical properties.</p>
Supervisor(s)	<p>Placet, Vincent (vincent.placet@univ-fcomte.fr)</p> <p>Rousseau, Jérôme (jerome.rousseau@u-bourgogne.fr)</p> <p>El Moussaid, Mohammed (mohammed.el-moussaid@u-bourgogne.fr)</p>
Candidate profile	<p>Master's degree in research or engineering school with a focus on mechanics. Skills in design/manufacturing. Experimental skills. Knowledge of wood, composite structures (laminates) and polymers. Proficiency in Matlab or Python. Mastery of a non-linear finite element code. Good writing skills in French and English. Dynamism, rigor and teamwork abilities.</p>
Keywords	<p>Plant Fiber Composites - Wood- Hybrid Laminates - Manufacturing - Optimization</p>
Application deadline	<p>15/06/2021</p>
Starting Job	<p>01/10/2021</p>



<p>Application <i>Depending on the type of position</i></p>	<p>PhD Position</p> <p>Please send the following documents (all in one PDF file) by e-mail to jerome.rousseau@u-bourgogne.fr :</p> <ol style="list-style-type: none">1) For EU candidates: Copy of your national ID card or of your passport page where your photo is printed. For non-EU candidates: Copy of your passport page where your photo is printed.2) Curriculum Vitae (1 page).3) Letter of motivation relatively to the position (1 page).4) Copy of your Master degree and/or Engineer degree if already available.5) Copy of your final marks and ranks.6) Coordinates of reference persons (maximum 3, at least your master thesis supervisor): Title, Name, organization, e-mail. <p>If you have questions regarding the application, please contact the supervisors.</p>
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