



Bamboo fibers valorization

1. Subject description

Since last decade, the interest for bio-sourced materials increased in composite sciences. These materials could answer to social and economic challenges, especially in environmental expectations. Purposes are to get the same behavior than fossil composites but less expensive, lighter and ecofriendly.

This internship aims to characterize micro and nano phenomena, with for example AFM (Atomic force microscope) of bio composite, (bamboo's fiber like fillers) and to study their effects on mechanical behavior at macroscale. This collaborative project involves two laboratories from UGA, LGP2 (Pulp and Pulp and Paper Science and Graphic Arts lab) and 3SR-Lab (Soils, Solids, Structures, Risks) and a Thai university (Chiang Mai Univ.) based on bamboo strips valorization for composite applications. The trainee will work in LGP2 in collaboration with a PhD student from the 3SR-Lab.

The main results expected:

- 1) A better understanding of the relationship between bio-composite structure and properties by a better knowledge of the interface and interphase of matrices and fillers systems.
- 2) Better fillers and matrices compatibilizations, without any chemical reactions on fillers.
- 3) Enhancing the bio-composite properties for building and transportation applications.

2. Organisation

Composite manufacturing:

The trainee will make composites based on 3 different matrices with 3 different processes

The following matrices are chosen according to their industrial applications and their polarity: they will have some different affinities with the fillers.

A bio-based epoxy resin (thermoset matrix and low polarity)

A bio-based polyethylene, a non-polar matrix.

And a polar thermoplastic matrix polyvinyl alcohol.

The processes chosen were adapted to the matrix. It could be infusion, thermo-pressing or film casting

Multiscale mechanical characterizations

The composite mechanical behavior will be realized at macroscale by Charpy test, tensile test, DMA, pull out. The SEM analyses will be led to measure the interface. The quantitative measurement of young modulus at nanoscale will be led by AFM in QNM mode and by approach and retract force curves. Tensile test under AFM and microtomography measurement could be considered.

3. candidate's profile

M2 student with good knowledge in materials and in bio-composites, is expected.

Good project management skills, autonomy and team working abilities are required. Some knowledge in force spectroscopy in AFM will be appreciated.

4. Contacts

To apply: resume, cover letter, reference letters and academic transcripts (from the last three years of study) should be sent before 1/02.2021 to:

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