

## PhD OFFER

### Treatment with cold-PIASma of fibErs from bio-ressouRces: Towards a complete chain of bio-composite eco-design and use for Industry 4.0

Acronym: TASER

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#### CONTEXTE:

«Treatment with cold-PIASma of fibErs from bio-ressouRces: Towards a complete chain of bio-composite eco-design and use for Industry 4.0 », acronym: TASER, is a project that intends to approach the study of complete value chain: i. the formulation of hybrid-composites from eco-responsible bio-sourced raw materials, ii. together with the worthwhile electrical cold plasma treatment, iii. with the aim of developing bio-sourced multi-scale structural materials elaborated for the Industry 4.0 (3D FDM). Attention will also be paid to the study of the microstructure (spherulite, transcristallinity, etc.) induced at the inter- faces/phases either between fiber/matrix assemblies, or between filament/filament deposits (FDM).

A double look at the physico-chemistry interactions in biomaterials ('pristine' and 'hybrid-formulated') will be settled: from the scale of each constituent to the scale of an architectural 3D printing system, while addressing the engineering of plasma processes. The composition (N<sub>2</sub>, O<sub>2</sub>), the field dynamics (time from a few seconds to a few minutes), the excitation kinetics (modulation of power) will be parameters of the cold plasma process to be optimised, jointly between experimental bases and numerical simulations.

At the crossroads of surface physics and materials engineering, TASER wishes to set up much broader dialogues, namely calling on the knowledge of agronomy (the science of agriculture from the "soil" to the "mission"), botany and geo-engineering.

## PROFILE:

Collaborative works between PERSEE and CEMEF CNRS 7635:

- Engineer / Master 2 / Advanced Master
- Materials Science, Mechanical Engineering, Chemistry-Physics
- Motivations in experimental and numerical works

## KEY-WORDS:

Lignocellulosic fibers, Bio-sourced polymer composites, Cold plasma, Bio-eco-concept, Industry 4.0, Surfaces, Structural integrity, Numerical data optimization, Worthwhile and clean process

## PLACE:

Mines Paris - PSL, Pierre LAFFITTE Campus, Sophia-Antipolis (Nice) France.

[More information](#)

## SUPERVISORS:

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## FUNDING:

The Transition Institute 1.5 (TTI.5) Mines Paris - PSL (<https://the-transition-institute.minesparis.psl.eu/en/>)

## START:

2023, June

## INVESTIGATION:

Plasma, 3D printing, Microstructures (OM, SEM, Tomography), Physics understanding and modeling of coupling

## CONTACTS AND REQUEST:

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## INFORMATION:

CV (with notes/ranking) and ideally letter(s) of recommendation.

## Références :

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THIS PHD WILL TAKE PLACE WITHIN THE FRAMEWORK OF THE TRANSITION INSTITUTE 1.5 (TTI.5).

TTI.5 IS A RESEARCH INSTITUTE OF MINES PARIS - PSL DEDICATED TO THE LOW-CARBON TRANSITION.

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