

Research Topic 03 for the ParisTech/CSC PhD Program

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:

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Subfield: Mech. Eng.

ParisTech School: Arts et Metiers ParisTech

Title: *Coupled fire and aging behaviours of bio-composites*

Advisor(s): Guillaumat Laurent, Laurent.guillaumat@ensam.eu, <https://artsetmetiers.fr>

Short description of possible research topics for a PhD: (10-15 lines in English + optional figure)

The main objective of this PhD study is to analyse the couple of fire and aging behaviours to, on the one hand, understand the different physical mechanisms and, on the other hand, propose solutions for the increasing of their performances.

The material should be a flax/polypropylene but we could imagine the testing of another one.

The work will be divided on the following steps:

1. Design, manufacturing and implementation of a fire equipment to realize fire tests;
2. Realization of different tests, using the experimental design technique mentioned above;
3. Analysis of the results to bring out the physical phenomenon and prepare some empirical models for predicting of fire and moisture safety and their couplings;
4. Modelling and simulation of the fire behaviour, including water content, using 3D model obtained by Finite Element Method (FEM).

Required background of the student: (Which should be the main field of study of the applicant before applying)

Mechanics and Materials

A list of 5 (max.) representative publications of the group: (Related to the research topic)

[1]MONTI A., EL MAHI A., JENDLI Z., GUILLAUMAT L., "Mechanical behaviour and damage mechanisms analysis of a flax-fibre reinforced composite by acoustic emission"

Composites Part A: Applied Science and Manufacturing, volume 90, july 2016, pp 100-110.

[2]CINQUIN, X. COLIN, B. FAYOLLE, M. MILLE, SVETLANA TEREKHINA, L. CHOCINSKI-ARNAULT, M. GIGLIOTTI, J-C. GRANDIDIER, M-CH. LAFARIE-FRENOT, M. MINERVINO, CH. CLUZEL, F. DAGHIA, P. LADEVEZE, F. ZHANG (2016) Thermo-oxidation behaviour of organic matrix composite materials at high temperatures, *Advances in Aircraft and Spacecraft Science*, Vol. 3 (2)

[3]LIANG S., GNING P.B., GUILLAUMAT L., "Quasi-static behaviour and damage assessment of flax/epoxy composites"

Material and Designs, volume 67, 15 February 2015, Pages 344-353.

[4]BOUKHOULDA F.B., GUILLAUMAT L., LATAILLADE J.L., ADDA-BEDIA E., LOUSDAD A., "Aging-impact coupling based analysis upon glass/polyester composite in hygrothermal environment."

Materials and Design, Vol 32, Pages 4080-4087, march 2011.

[5]GUILLAUMAT L., HAMDOUN Z., "Reliability modelling of drilled composite structures."

Composite Structures, Volume 74, Issue 4, Pages 467-474, August 2006.