

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:  
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### Research Topic for the ParisTech/CSC PhD Program

**\*Field (cf. List of fields below):**

Materials Science, Mechanics, Fluids

**Subfield:** (Applied Physics, Chemistry, Mathematics, Mech. Eng. etc...)  
Mech. Eng.

**Title:**

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

**ParisTech School:**

Ecole Nationale Supérieure d'Arts et Métiers

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

The applications of natural fiber-based bio-composites in automotive components, building materials and aerospace industry are increasing, due to their ecological and economic advantages compared to synthetic composites. The main objective of this PhD study is to analyze the couple of fire and aging behaviors to, on the one hand, understand the different physical mechanisms and, on the other hand, propose solutions for the increasing of their performances. As also, realization of durability tests whether fatigue, impact or humid aging coupled by physico-chemical characterization and non-destructive and destructive controls of bio-composite materials.

The facility to realize exposure to fire has to be design.

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

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

The applicant should have a good background in materials and mechanics, and should be interested in both numerical simulations and experimental techniques.

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

- A. Monti, A. El Mahi, Z. Jendli, L. Guillaumat, "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.
- S.Liang, P.B. Gning, L. Guillaumat, "impact behaviour of flax/epoxy composite plates", international journal of impact engineering, volume 80, June 2015, Pages 56-64.
- S.Liang, P.B. Gning, L. Guillaumat, "A comparative study of fatigue behaviour of flax/epoxy and glass/epoxy composites.", Composites Science and Technology, Volume 72, Issue 5, pp 535-543, 2012.
- P.B. Gning, L. Guillaumat, S.Liang, PUI W.J. "Influence of process and test parameters on the mechanical properties of flax/epoxy composites using response surface methodology.", Journal of Materials Science, Vol 46, Issue 21, Page 6801-6811, 2011.
- L. Guillaumat, F. Baudou, A.M. Gomes de Azevedo, J.L. Lataillade, "Contribution of the experimental designs for a probabilistic dimensioning of impacted composites.", International Journal of Impact Engineering, Vol. 31, Issue 6, pp 629-641, July 2005.