

POSITION FOR POST-DOCTORAL RESEARCHER

“Characterization and modeling for the manufacturing process of 3D tufted textile reinforcement for composites”

General description

Three dimensional (3D) textile composites are expanding their industrial applications in numerous sectors by dint of their superior mechanical properties to conventional laminated composites, such as the excellent resistance against interlaminar delamination. In particular, the development of new technologies to fabricate 3D textiles lead to a widespread use of these materials for many industrial applications. One of the cost-effective technologies is the tufting to introduce through-thickness fibers or yarns into textile reinforcement.

The French national project “COMP3DRE” supported by ANR (Agence Nationale de la Recherche) aims to address the fabrication of 3D textile reinforcement, the analysis and optimization of the influence of fabric architecture on the mechanical properties and manufacturing characteristics such as drapability and impregnation, and the development of industrial applications, by experimental characterization and numerical simulation. In this context, IMT Lille Douai seeks for a post-doctoral researcher who is supposed to perform the experimental work about the resin impregnation into 3D tufted textile reinforcement and the numerical modeling of resin flow.

Objectives

The missions of the post-doctoral researcher are to investigate the influence of the 3D fabric architecture on the manufacturing characteristics and the mechanical properties of final composite parts, both by experimental measurement and by analytical or numerical modeling. Specifically, the post-doctoral researcher shall characterize the permeability tensor of 3D tufted textile reinforcements. Another important task is to experimentally investigate the generation of void defects (a.k.a. porosities) during the resin impregnation process and to propose an analytical or numerical model to predict the void formation in terms of process condition (e.g. resin injection pressure or velocity) and of material properties (e.g. tufting density of textile reinforcement, resin viscosity, resin surface tension and contact angle, etc.). Finally, a couple of demonstrators will be fabricated by liquid composite molding processes with thermoset or thermoplastic resin to prove the concept of development proposed in this project.

Profile

Degree: PhD in Mechanical Engineering or Materials Science of Composite Materials.

Skills and knowledge:

- Strong background of the composites manufacturing processes
- Solid expertise in the liquid composite molding processes (thermoset and thermoplastic resins)
- Profound knowledge in fluid mechanics (in particular, flow in porous media and microfluidics) and polymer rheology
- Experimental skills for textile reinforcement characterization (permeability, wettability, micrography)
- Competency of numerical simulation (C/C++ programming, finite element methods)
- High proficiency in spoken and written English

Conditions

The intended starting date is June 2018 at the earliest and no later than September 2018, and the duration of the contract is 24 months (contract CDD in French term; employed by ARMINES; net monthly salary is commensurate to experience with a minimum of about 2 050 euros).

Applicants should (preferably via e-mail) send a letter of motivation with curriculum vitae, a description of research work and a list of publication (and a couple of letters of recommendation) to:

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