

**PhD Fellow at the Mechanical Department, Laboratory ICube, Université de Strasbourg  
France**

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**Financial Support :** DGA (Direction Général de l'armement)

**Scholarship:** about 1700 Euros/month, tax-free

**Period:** 3 year

**Starting time:** September/October 2014

**Title:** Degradation mechanisms under dynamic thermomechanical loadings of layered polymer parts: characterization and modeling

**Key Words:** damage, dynamic lading, failure, temperature, polymer, microstructure

**General description of of the project:** The proposed research project relates to the study of layered polymeric materials used to manufacture defense structures using rapid prototyping processes such as 3D printing. These structures are subjected to coupled and repeated mechanical and thermal chock loadings. This results in cumulated damage leading to the material failure. Polymeric materials are highly damageable and highly rate-and-temperature sensitive. Thus, establishing an approach describing the initiation, propagation and failure of polymers subjected to repeated shock loadings requires taking into account the dynamic response which is strongly dependent the material microstructure, loading rate and temperature. It is therefore essential to understand and describe the mechanisms at different scales of the layered polymer that is involved in this type of loading. These mechanisms should then be integrated in a micromechanically-based damage model.

The main objective of the thesis work is to develop better understanding, via observations and measurements, of different damage and failure mechanisms under repeated chock loadings. For this, we will utilize impact testing systems that we have developed in our laboratory for the analysis of dynamic behavior of polymers: 1- Hopkinson Pressure Bar equipped with specific thermal enclosures for hot and cold tests, and 2- Drop Weight Impact Testing System. We will couple our thermomechanical experimental techniques with fast imaging and fluorescence techniques which are available in ICUBE laboratory within the imaging research team.

Finally, the observed damage mechanisms under impact loading should be integrated in micromechanical approach to predict the mechanical response and failure of layered polymeric structures subjected to repeated dynamic loadings.

**Advertisement:**

- European nationality.
- under 27 years on 1st October of the year.
- Master 2 or equivalent to prepare a PhD thesis (or in preparation of this degree in the year of submission of the application).

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