

MODELING OF FIBER-BASED STRUCTURES - TEXTILES AND TEXTILE REINFORCED COMPOSITES

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ABSTRACT

The need to characterize the mechanical behaviour of textile materials is increasing with their growing use in many industrial applications (composite reinforcements, biomedical implants, handling, etc.), in the form of tows, yarns, braids, knittings, non woven, 2D or 3D woven fabrics. The characterization and the identification of the mechanical behaviour of such materials is made difficult by the complexity of their internal structure, by their multi-scale nature, and by the contact-friction interactions between components at different scales. While the modeling of these structures was previously based mainly on geometrical methods and on simple analytical models, new approaches using computational mechanics have been developed over recent years, allowing to address more complex issues of textile mechanics. This mini symposium will review different approaches intended to describe the internal geometry of textile materials, to model the behaviour of their components at different scales, to assess their global mechanical properties and to predict the occurrence of damage. The symposium will focus especially on the following topics :

- description, characterization of the internal micro-geometry;
- modeling of mechanical properties of textile components at different scales;
- multi-scale strategies and homogenization techniques;
- modeling of failure and damage at different scales;
- modeling of the global behaviour under complex loadings;
- simulation of textile manufacturing process.

The goal of the symposium will be to connect people using various modeling and simulation techniques to provide solutions to problems of textile engineering design. It will also demonstrate to the computational mechanics community the interests and specificities of problems encountered in the mechanics of textile materials.

REFERENCES

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