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COMPUTATIONAL MODELING AND VIRTUAL TESTING OF COMPOSITE STRUCTURES

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ABSTRACT

Engineering lightweight structures are nowadays frequently made of composite materials. When designing such structures, challenging topics such as safety, reliability, durability, low cost, low weight and low energy consumption have to be considered. For highly stressed primary structures, e.g. aircraft wings or wind turbine rotor blades, physical tests become more and more expensive. There is hence a need for accurate and reliable simulation procedures in the context of virtual testing. However, the computational modelling of the mechanical behaviour of composite structures is very challenging. The micro- and mesostructure of a composite material makes it highly inhomogeneous, resulting in a structural response with complex stress states and damage mechanisms that is generally very difficult to predict accurately.

This minisymposium focuses on the computational modelling of fibre-reinforced composite structures with an emphasis on lightweight materials consisting of continuous fibres and polymeric matrices. Other related materials such as hybrid composites are also included. Material modelling on the macroscale is of interest as well as microscale, mesoscale, or multiscale modelling. However, all contributions should be linked to the scale of an engineering structure. The following is an excerpt of the numerous possible topics of interest:

- Virtual testing of large-scale structures
- Vibration and fatigue / Buckling and postbuckling / Damage and fracture
- Joining technologies / Adhesive joints
- Prediction of residual stresses
- New materials and applications / Adaptive systems