Damage initiation and propagation in fiber reinforced composites: observation and modeling

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Abstract

An overview of Fiber Reinforced Composites' (FRCs) manufacturing an its consequences on the properties of the cured material will be presented. FRC are increasingly used for primary structures in the aerospace industry. FRC's damage starts at the fiber-level then grows through the heterogeneous material [2]. Quantitative data of the deformation fields in the fiber's vicinity during damage are essential to calibrate simulation models able to handle simultaneous initiation and growth of several damage mechanisms. After analysis of the results, an in-plane displacement resolution of $\pm 0.1 \mu m$ can be reached.

Results from such experiments will be presented. A 1D Peridynamics'[1] based Prony series viscoelastic constitutive model [3] has been developed. Such a model can be implemented into the existing *Peridigm* open-source software for Peridynamics' simulations. Full-field measurements have been prepared for a 1D fiber, a 2D film and a 3D dogbone specimen under quasi-static tensile loading. A Peridynamics inverse method based on the quantification of energy available for each material point can be developed to implement and calibrate an energetical damage model [4].

References

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