Virtual Test Lab framework for progressive damage simulations in unidirectional composite laminates

O. Falcó, B. Tijs, C. S. Lopes
IMDEA Materiales

Keywords: Finite element analysis (FEA), Composite laminates, Progressive failure analyses, Computational modelling, virtual testing

ABSTRACT

A reliable Virtual Testing framework has been implemented for Abaqus to allow progressive damage simulations and strength prediction for unidirectionally laminated composites.

The prediction of both intralaminar and interlaminar failure mechanisms in the mechanical behaviour involves cohesive-friction interactions using surface-base contact formulations, on sophisticated three-dimensional continuum damage models.

In addition, to capture the appropriate crack paths in unidirectional plies, an efficient approach based on mesh structuring and crackband erosion was developed.

A rigorous validation program is presented, demonstrating that the Virtual Testing Lab. is robust and can be reliably used in the processes of composite materials screening, design and certification.