Strength prediction of notched thin-ply laminates

A. Arteiro*, J. Reinoso† and P.P. Camanho*

* DEMec, Faculdade de Engenharia
Universidade do Porto
Rua Dr. Roberto Frias, 4200-465 Porto, Portugal
e-mail: aarteiro@fe.up.pt, web page: https://sigarra.up.pt/feup/

† Elasticity and Strength of Materials Group, School of Engineering
Universidad de Sevilla
Camino de los Descubrimientos s/n, 41092, Seville, Spain
e-mail: jreinoso@us.es - Web page: http://www.us.es/

ABSTRACT

Thin-ply laminates are a new class of composite materials with great potential for application in the design of thinner and highly optimised components, resulting in potential weight savings and improved mechanical performance. These new composites can stir the development of lighter structures, overcoming current design limitations as well as notably reducing the onset and development of matrix cracking and delamination events. This work shows two recent modelling methods for the failure analysis and strength prediction of open-hole thin-ply laminates under tensile loading, which exhibit a brittle response upon failure: (i) the analytical coupled energy-stress Finite Fracture Mechanics (FFMs) criterion, and (ii) the FE-based Phase Field (PF) approach for fracture that is incorporated into an enhanced assumed solid shell element. The predictions obtained using both strategies are compared with experimental data. These correlations exhibit a very satisfactory level of agreement, proving the robustness and reliability of both methods under consideration.

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