Accepted Manuscript

Mode I Interlaminar Fracture of Carbon Epoxy Laminates: Effects of Ply Thickness

G. Frossard, J. Cugnoni, T. Gmür, J. Botsis

PII: S1359-835X(16)30303-7
DOI: http://dx.doi.org/10.1016/j.compositesa.2016.09.009
Reference: JCOMA 4423

To appear in: *Composites: Part A*

Received Date: 24 May 2016
Revised Date: 30 August 2016
Accepted Date: 10 September 2016

Please cite this article as: Frossard, G., Cugnoni, J., Gmür, T., Botsis, J., Mode I Interlaminar Fracture of Carbon Epoxy Laminates: Effects of Ply Thickness, *Composites: Part A* (2016), doi: http://dx.doi.org/10.1016/j.compositesa.2016.09.009

Mode I Interlaminar Fracture of Carbon Epoxy Laminates: Effects of Ply Thickness

G. Frossard, J. Cugnoni, T. Gmür, J. Botsis *[1]

École Polytechnique Fédérale de Lausanne (EPFL), STI-LMAF, CH-1015 Lausanne, Switzerland

ABSTRACT

In this work, the influence of ply thickness on strain energy release rate (ERR) in delamination of carbon-epoxy laminates is addressed. Specimens with three ply thicknesses: 0.030, 0.075 and 0.150 mm are tested. While the ERR at onset of crack propagation is independent of ply thickness, the plateau level is much lower in thin-ply laminates than in thicker ply ones. This effect is attributed to changes in microstructure, caused by the tow spreading process involved in the fabrication of prepregs. Fiber and matrix rich regions observed only in thick ply laminates promote the development of large bundles of bridging fibers which exert large closing forces, leading to higher ERR in thick-ply laminates. Fiber bridging distribution is identified using an iterative procedure from R-curve results, and implemented in cohesive element models. This identification method provides reliable results, as the simulated load-displacement curves are in good agreement with experimental results.

KEYWORDS: A: Carbon fibers; B: Delamination; C: Finite element analysis; D: Mechanical testing.

* Corresponding author
E-mail address : john.botsis@epfl.chjoh (John Botsis)