Out-of-autoclave scarf repair of interlayer toughened carbon fibre composites using double vacuum debulking of patch

H.M. Chong, S.L. Liu, A.S. Subramanian, S.P. Ng, S.W. Tay, S.Q. Wang, S. Feih

PII: S1359-835X(18)30002-2
DOI: https://doi.org/10.1016/j.compositesa.2018.01.001
Reference: JCOMA 4882

To appear in: *Composites: Part A*

Received Date: 13 September 2017
Revised Date: 30 December 2017
Accepted Date: 2 January 2018

Please cite this article as: Chong, H.M., Liu, S.L., Subramanian, A.S., Ng, S.P., Tay, S.W., Wang, S.Q., Feih, S., Out-of-autoclave scarf repair of interlayer toughened carbon fibre composites using double vacuum debulking of patch, *Composites: Part A* (2018), doi: https://doi.org/10.1016/j.compositesa.2018.01.001

Out-of-autoclave scarf repair of interlayer toughened carbon fibre composites using double vacuum debulking of patch

H. M. Chong[1], S. L. Liu[2], A. S. Subramanian[1], S. P. Ng[1], S. W. Tay[2], S. Q. Wang[2] and S. Feih[1,*]

[1] Joining Technology Group, Singapore Institute of Manufacturing Technology, 2 Fusionopolis Way, 138634, Singapore

[2] Polymeric Materials, Institute of Materials Research and Engineering, 2 Fusionopolis Way, 138634, Singapore

Submitted to: Composites Part A

Abstract

Interlayer particle toughened carbon fibre composites play an integral role in the lightweight design of primary aerospace structures. We investigate an out-of-autoclave method using double vacuum debulking (DVD) to perform in-situ soft patch repairs. Utilizing the DVD process decreases the porosity of the co-cured film adhesive and patch from 4.7% to 0.4%, thereby increasing the flexural and interlaminar shear strength of 1D repair laminates by 30% to levels equal to autoclave cured laminates. In contrast, the higher void content did not significantly affect straight (2D) and round (3D) scarf repair strengths. 3D repairs showed significantly improved strength recovery compared to 2D repairs due to the stress shedding in the hoop direction. Finally, DVD process parameters may be optimized to reduce repair time by increasing the temperature and ramp rates while reducing the soak times, with no detrimental effects on porosity or strength observed.

* Corresponding author: +65 6590 3167, feihs@SIMTech.a-star.edu.sg