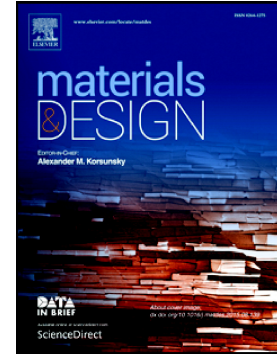


Accepted Manuscript

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PII: S0264-1275(16)31414-9
DOI: doi: [10.1016/j.matdes.2016.11.025](https://doi.org/10.1016/j.matdes.2016.11.025)
Reference: JMADE 2461
To appear in: *Materials & Design*
Received date: 5 October 2016
Accepted date: 6 November 2016

Please cite this article as: Mehdi Yasaee, Lawrence Bigg, Galal Mohamed, Stephen R. Hallett , Influence of Z-pin embedded length on the interlaminar traction response of multi-directional composite laminates. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Jmade*(2016), doi: [10.1016/j.matdes.2016.11.025](https://doi.org/10.1016/j.matdes.2016.11.025)

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Influence of Z-pin embedded length on the interlaminar traction response of multi-directional composite laminates

Mehdi Yasaee^{1*}, Lawrence Bigg², Galal Mohamed², Stephen R. Hallett²

¹ School of Aerospace, Transport and Manufacturing, University of Cranfield, Cranfield, MK43 0AL, UK

² Advanced Composites Centre for Innovation and Science (ACCIS), University of Bristol, Queen's Building, University Walk, Bristol, BS8 1TR, UK

* m.yasaee@cranfield.ac.uk +44(0)1234 75 4384

Abstract

The work in this paper investigated the performance of composites through-thickness reinforcing Z-pins as a function of their embedded length in pre-preg laminates. Single Z-pins were inserted into multidirectional carbon fibre laminates with increasing thicknesses, corresponding to embedded lengths from 1mm to 10mm and tested through a range of mixed mode displacement ratios to investigate their interlaminar bridging traction response. Detailed analysis of the tests revealed a non-linear tangential friction response and its strong dependence on the embedded length of the Z-pin. Using a new power law empirical relationship for the tangential friction force per unit length, a modified Z-pin bridging traction analytical model was proposed, giving good predictions of the full mixed mode bridging mechanics of a CFRP Z-pin in a multidirectional composite laminate of varying thickness. Several characteristics of the model are discussed and their influence on the predicting the Z-pin bridging energy response have been analysed.

Keywords

Structural composites; Z-pins; Delamination; Fracture toughness; Analytical model

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