New test approach to determine the transverse tensile strength of CFRP with regard to the size effect

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Material & Testing

- Unidirectional prepreg material HexPly-M21/34%/UD194/T800S (Hexcel) → [90]ₙ, where n is n = 3, 5,10,16 (specimens thickness)

- Three plates of each configuration are produced in order to regard statistical variations of the manufacturing process within the test results.

Transverse Tensile Strength $R_{22}^T$
Results

Transverse tensile strength versus specimen volume

[Graph showing transverse tensile strength versus specimen volume]
Results

Transverse tensile strength versus specimen volume

Weibull weak link scaling diagram

\[
\frac{\sigma_{\text{ult},1}}{\sigma_{\text{ult},2}} = \left( \frac{V_1}{V_2} \right)^{\frac{1}{m}}
\]

\[m = 11.17\]
Conclusion

First transverse failure occurs at the most critical defect (weakest link) and second failure strength is higher than first failure strength.

The new method provides a more accurate measure of transverse tensile strength, which may be used along with Weibull scaling to predict transverse strength of smaller volumes e.g. 90° layers in cross-ply laminates during fatigue loading or micromechanical modelling.
Thank you for your attention!

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