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HYBRID EFFECTS IN THIN-PLY LAMINATES

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As part of the HiPerDuCT programme on High Performance Ductile Composites Technology thin-ply glass-carbon hybrid laminates have been investigated. It has been demonstrated that if the carbon plies are very thin, delamination can be suppressed, and progressive fragmentation of the carbon can be obtained [1], with a pseudo-ductile unidirectional tensile response and plateau in the stress-strain curve, e.g. Fig. 1.

The strain at first carbon fracture can be determined through analysis of videos recorded during the tests. In this presentation the values of failure strain are investigated for different carbon ply thicknesses and compared with those for un-hybridised carbon fibre material in order to establish the magnitude of the hybrid effect. It is shown that much of the apparent hybrid effect is due to too low values of failure strain for the carbon caused by premature failure in unidirectional tensile tests. However for very thin plies there is indeed a real hybrid effect resulting in higher strains to failure which increases the performance and attractiveness of these pseudo-ductile hybrid materials.

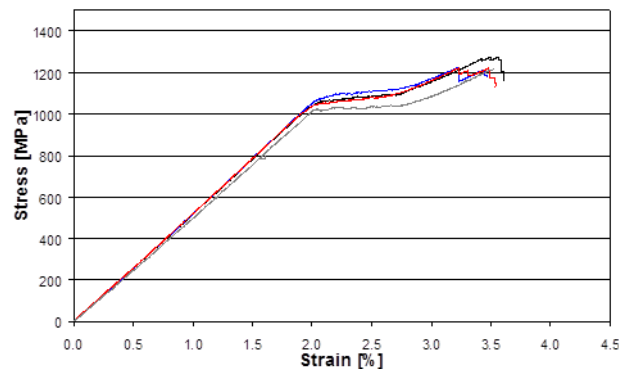


Figure 1. Pseudo-ductile tensile response of UD glass/carbon thin-ply laminate

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References

- [1] G. Czel and M. R. Wisnom (2013) Demonstration of pseudo-ductility in high performance glass/epoxy composites by hybridisation with thin-ply carbon prepreg. *Composites Part A*, **52**, 23-30.