

INTERLEAVING THERMOPLASTIC NON-WOVEN VEILS TO ENHANCE THE STRUCTURAL BEHAVIOUR OF CO-CURED COMPOSITE JOINTS

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WHY COMPOSITE BONDED JOINTS?

- Lighter structure
- Comparatively uniform stress/load transfer
- No need to drill holes (No damage to the composite laminate)

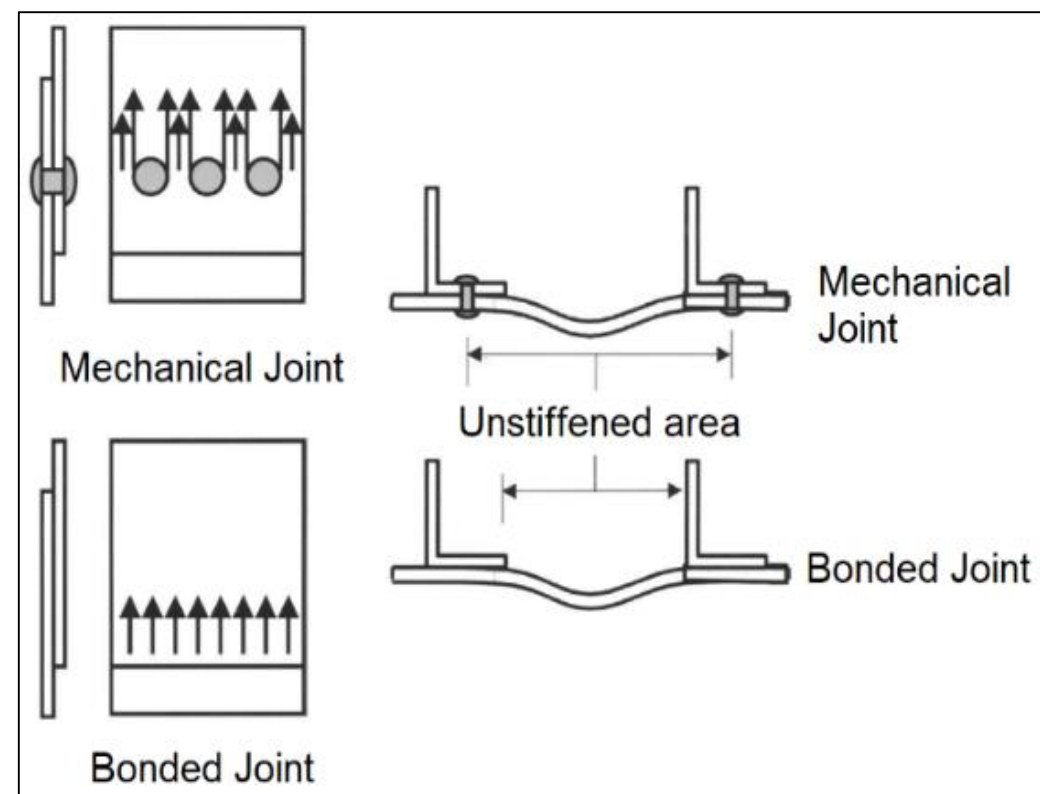


Figure 1: Load transfer map of composite joints [1].

WHY CO-CURING?

- No surface preparation required.
- One-step manufacturing (simultaneous bonding and curing).
- However, co-cured joints have low fracture resistance!

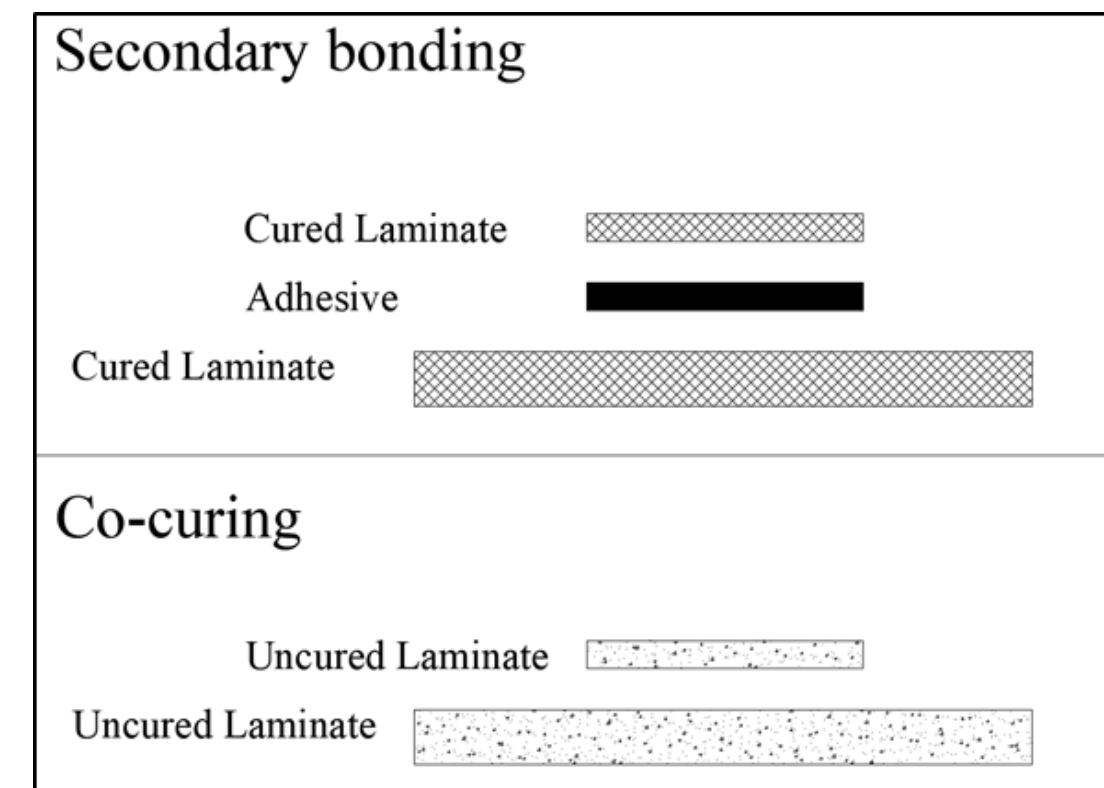
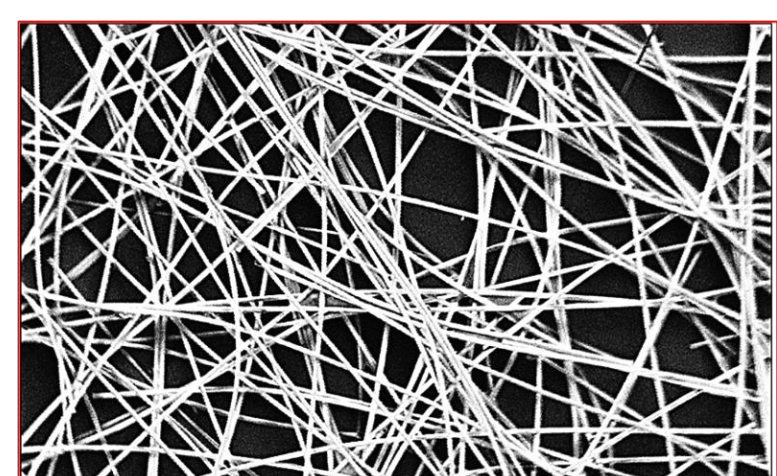


Figure 2: Commonly used bonding strategies.

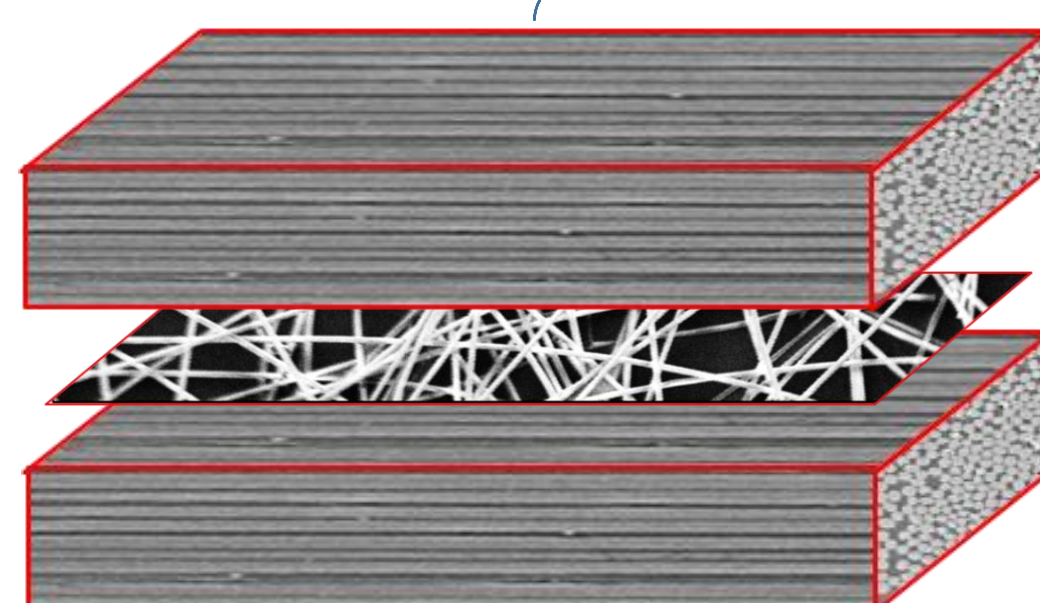
HOW TO ENHANCE FRACTURE PROPERTIES?

- Interleaving thermoplastic non-woven veils to the interlaminar regions of CFRP laminates [2].

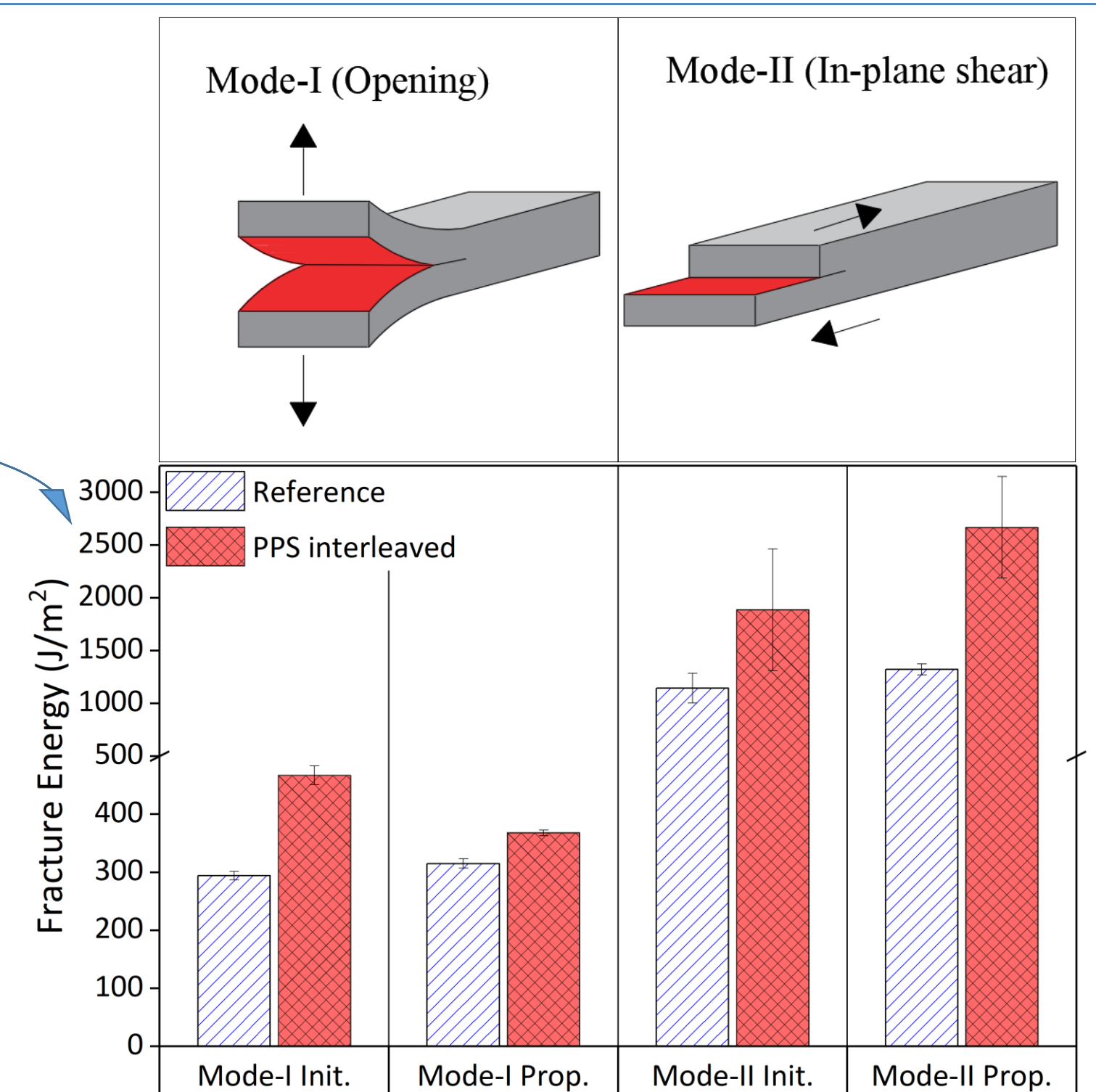


10 g/m² Polyphenylene sulphide (PPS) microfibre non-woven veil

Interleaving

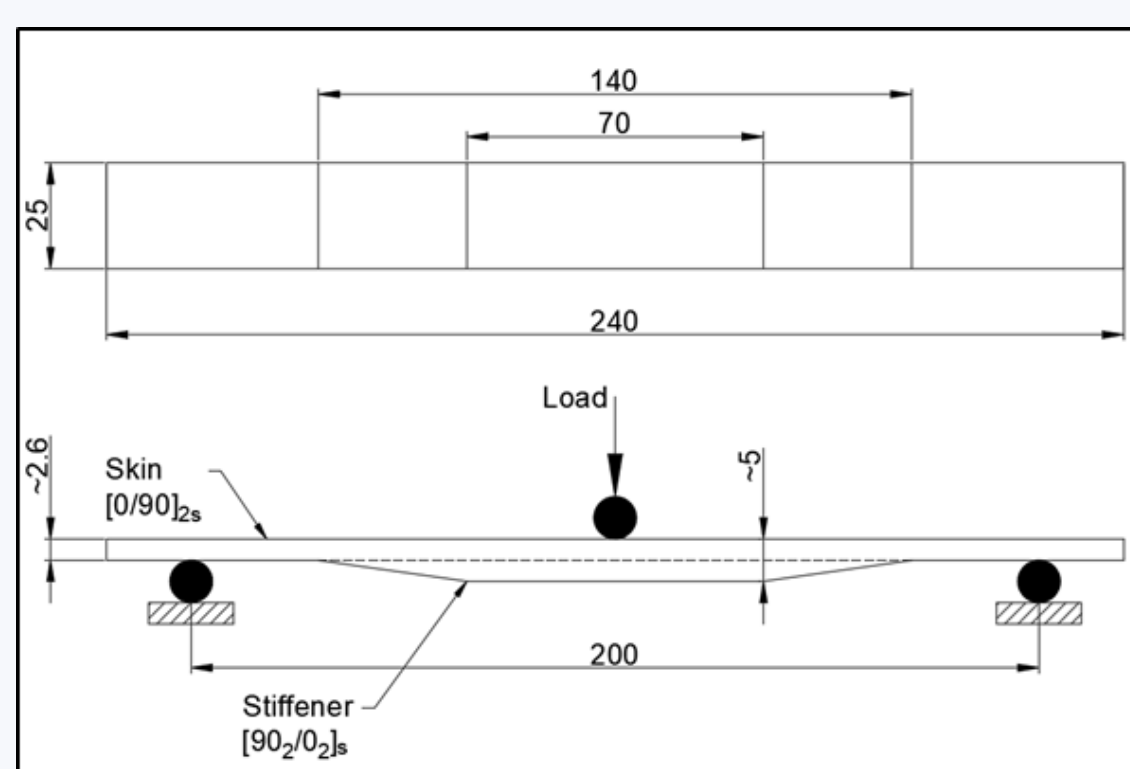


Enhanced fracture toughness



CAN IMPROVED FRACTURE TOUGHNESS BE TRANSLATED TO SKIN-STIFFENER CO-CURED JOINTS?

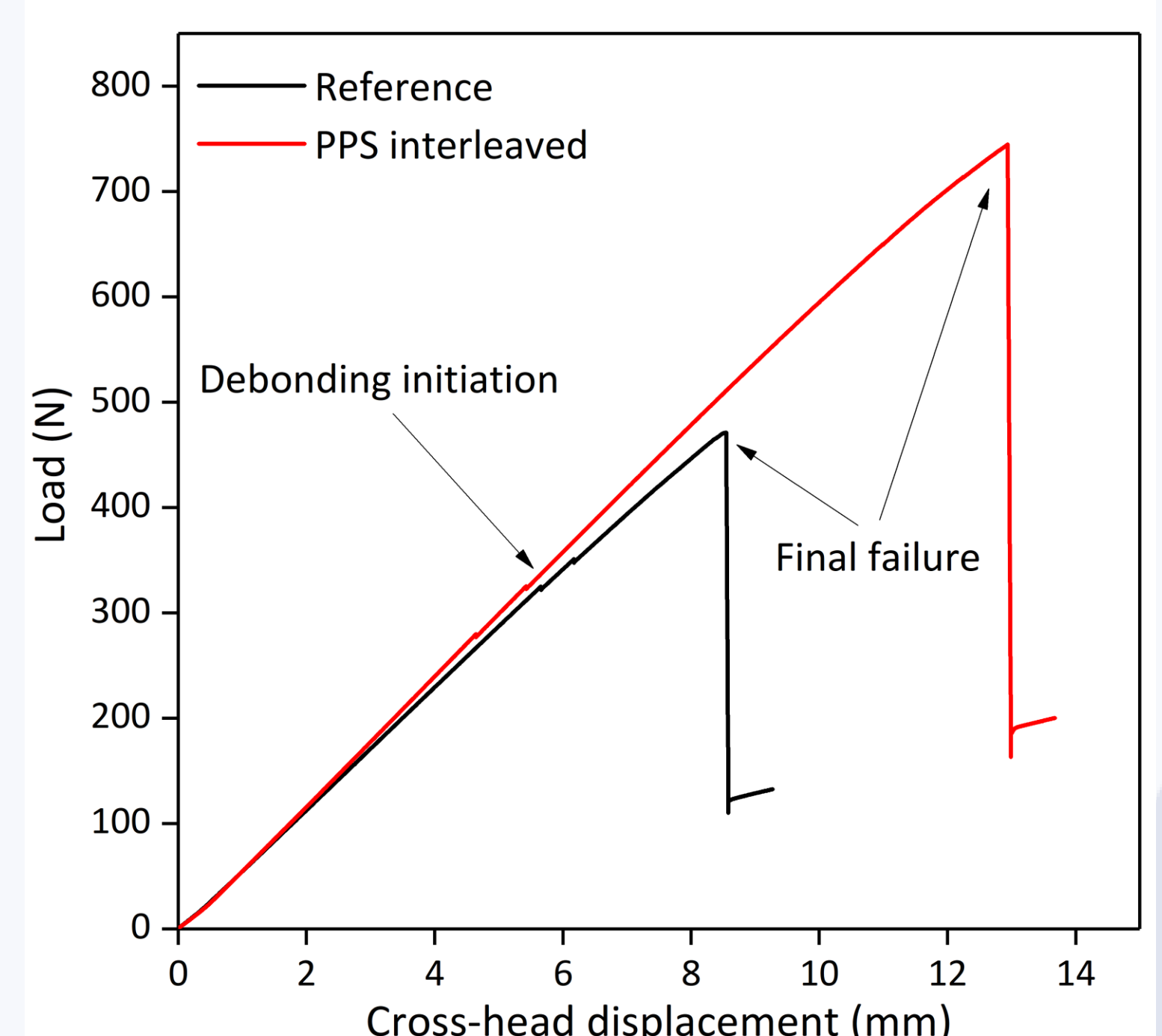
- One-layer of PPS microfibre non-woven veil at the skin-stiffener interface significantly improves the failure load.



Quasi-static three-point bending testing of cross-ply skin-stiffener co-cured CFRP joint



Skin-stiffener debonding / final failure



References:

1-Campbell Jr, F.C., Manufacturing processes for advanced composites. 2003: Elsevier.

2-İnal, O., Akbolat, M. Ç., Soutis, C., & Katnam, K. B. (2021). Toughening mechanisms in cost-effective carbon-epoxy laminates with thermoplastic veils: Mode-I and in-situ SEM fracture characterisation. International Journal of Lightweight Materials and Manufacture, 4(1), 50-61.