

Shear Property Analysis of Thermoplastic Hybrids



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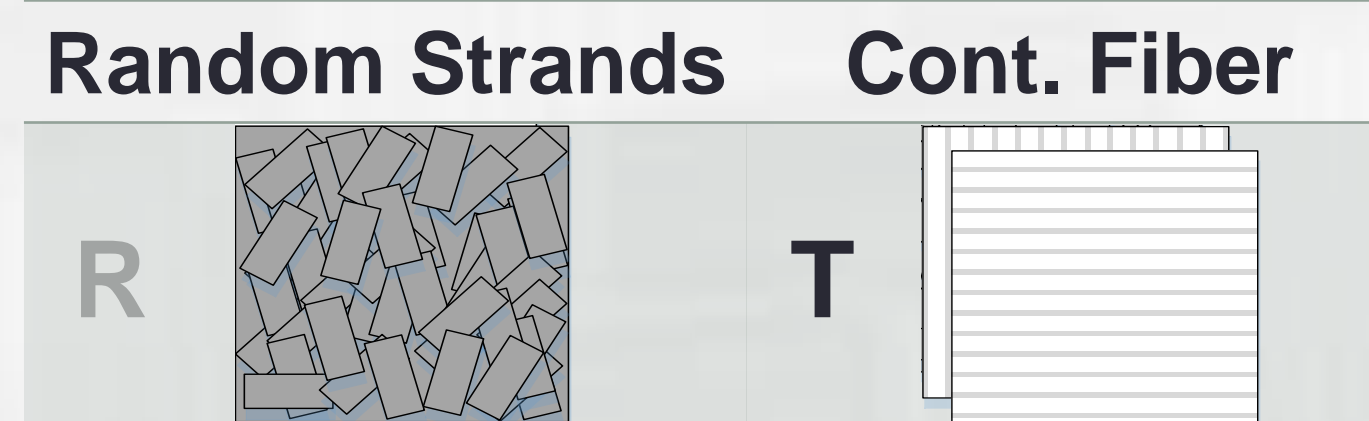
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BACKGROUND

- Applications of continuous fiber reinforced composites in aerospace industry
 - Long manufacturing cycles and high cost
 - Weak interlaminar shear**

- Random strands are an interesting alternative material



Formability



Mechanical Performance



Design

Complex shapes
Low loads

Simple shapes
High loads

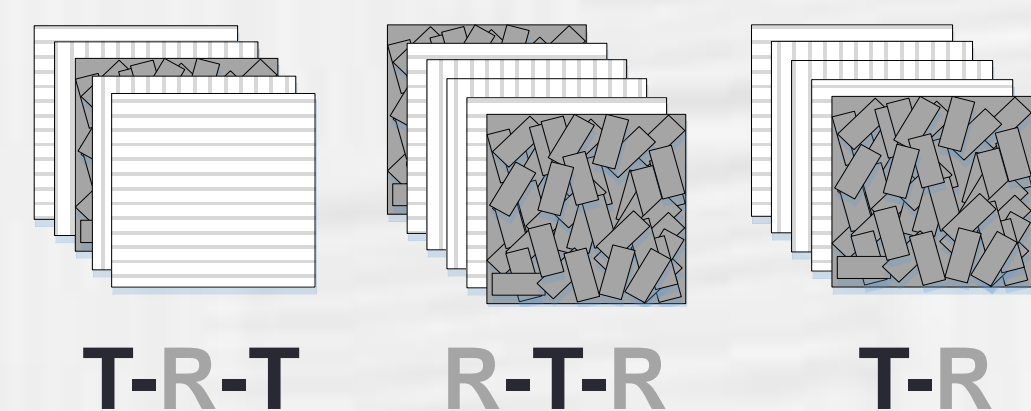
Objective

Study interlaminar shear in hybrid configurations of these 2 materials

METHODOLOGY

Hybridization

- 3 different laminates (T)
- 3 Lay up configurations
- 3 T/R ratios



Short Beam Shear Testing

Three Major Failure Modes

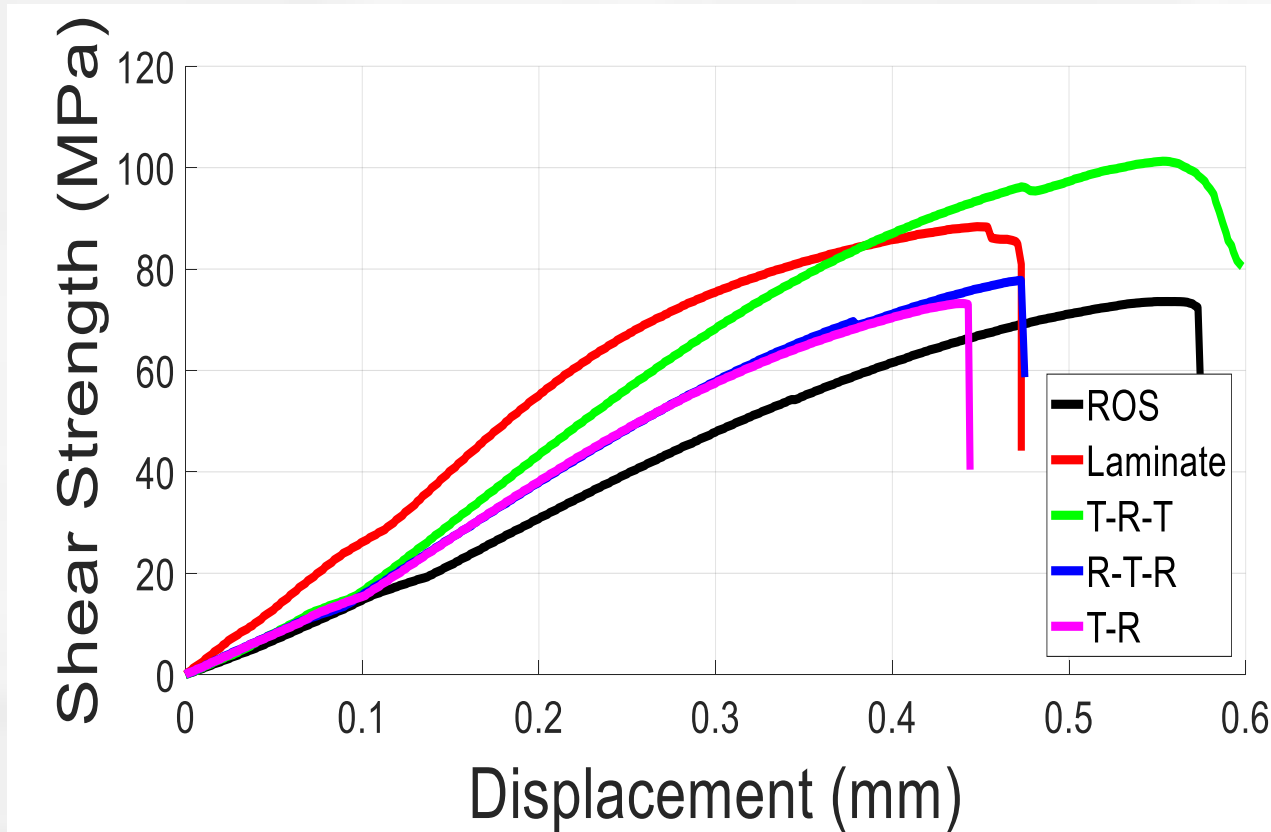
- Interlaminar Shear Failure
- Tension/Compression Failure
- Inelastic Deformation



Three point bending fixture (ASTM D2344)

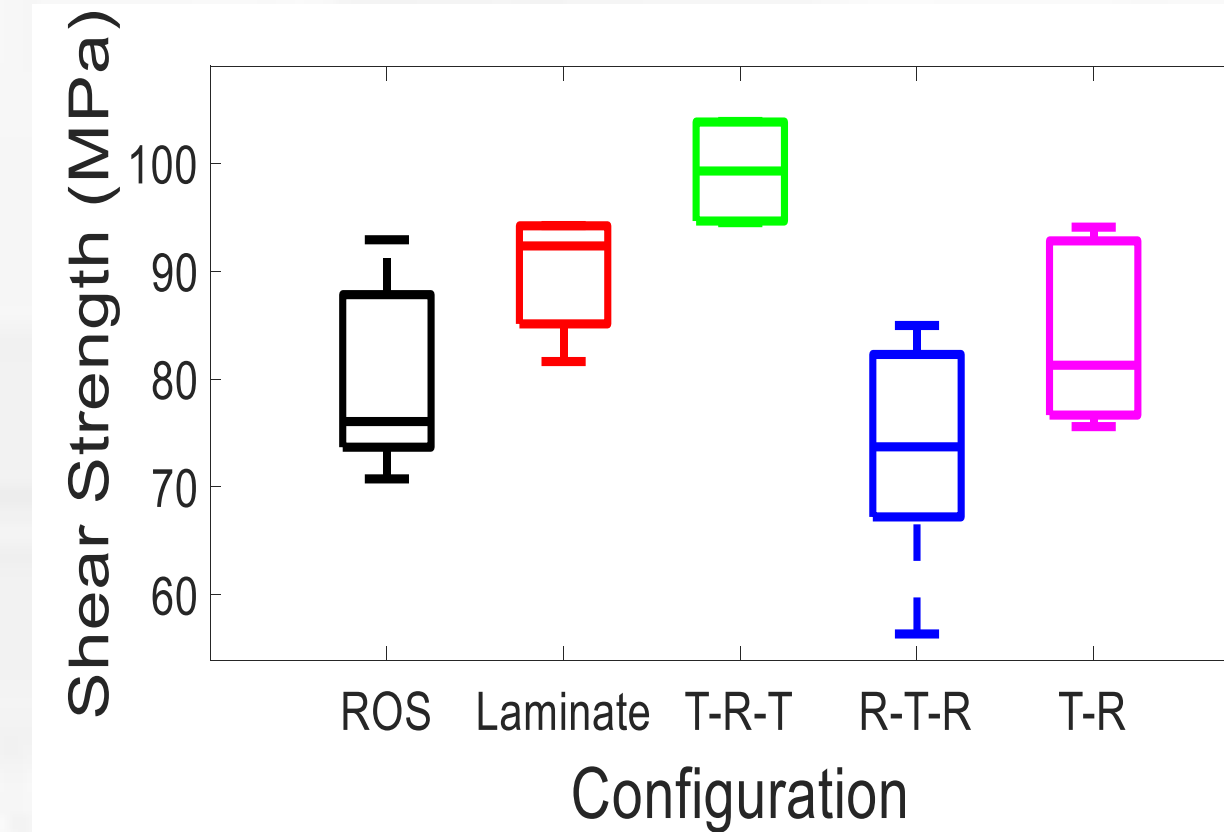
RESULTS

SHEAR STRENGTH



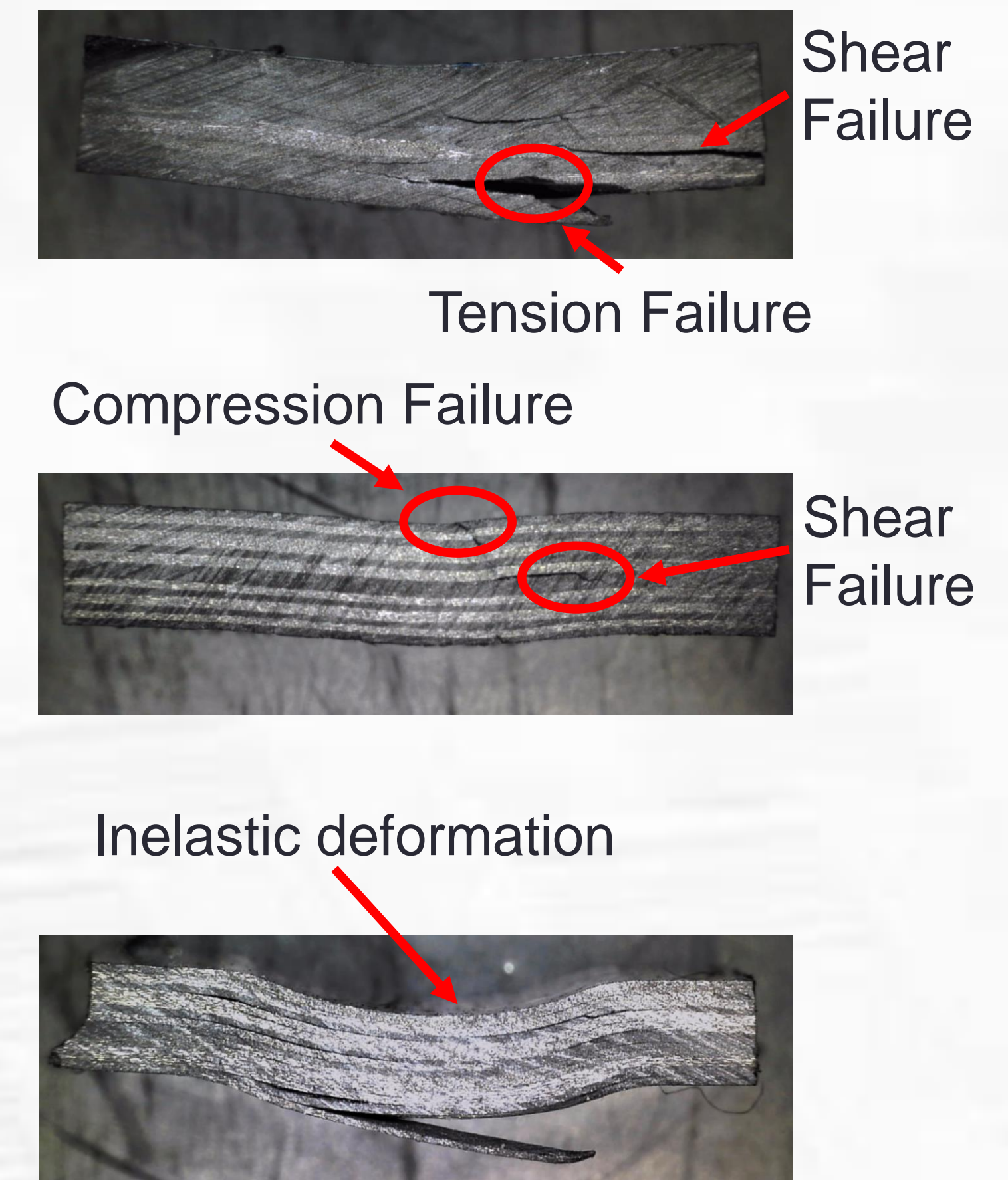
- Increase in strength shown in some hybrids
- T-R-T lay-up has the highest shear strength
- Synergy seems to exist in specific hybrids, e.g., T-R-T

VARIABILITY



- High variability in random strands is compensated by reinforcing ROS with a laminate group
- Some configurations tend to have similar variance

FAILURE DETECTION



OTHER HYBRIDS

- Mean strength calculation (MPa)

ROS	Laminate	T-R-T	R-T-R	T-R
80.03	89.74	99.25	73.45	84.07

- Among all the hybrids the strongest configuration is
 - Cross-ply laminate
 - T-R-T layup
 - T/R ratio of 20/80
- 25% Increase in shear strength shown

CONCLUSION

- Reduction in variability when using hybrids and improvement in properties
- Shear Strength improvement depends on the hybrid layup configuration

FUTURE WORK

- Conduct 4-point bending test
- Study the influence of hybridization on bending property