

# Influence of resin's chemistry on the bulk properties of CFRPs processed with recycled carbon fibers

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**Keywords:** rCF, 2<sup>nd</sup> generation composites, ILSS

## Abstract:

The research presented here attempts to assess the potential for re-using carbon fibre (CF) fabrics recovered from recycling infusible acrylic thermoplastic carbon fibre reinforced polymer composites (CFRPs) in a universal manner, i.e. by combining with a wide variety of matrices to manufacture 2nd generation composite laminates by resin infusion. The 2nd generation composites have been compared in terms of bulk and interfacial properties against counterparts processed with virgin carbon fibre fabric infused with the same matrices. The properties of the 2nd generation composites as investigated by ILSS, 3PB and SEM seemed to reveal a not-so-strong influence of the matrix type which makes it effective for universal reuse.

## The RT based Recycling process

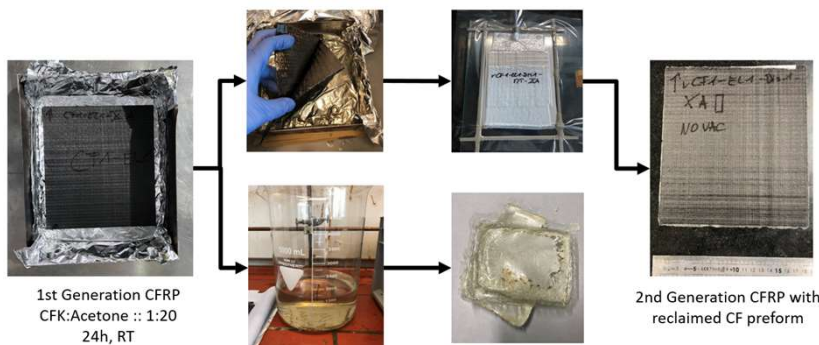


Fig. 1: Undamaged pre-forms and matrix recovered which opens the possibility for 2nd gen CFRPs to be VARI processed.

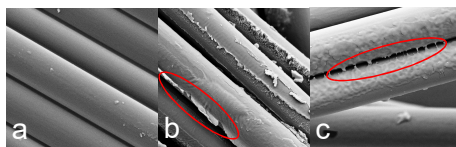


Fig. 2: a) virgin CF; b) and c) rCF. XPS and EDX showed **sizing** and Elium remnants in the rCF → **strong reuse potential**.

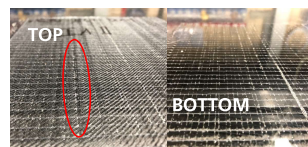


Fig. 3: Surface finish of 2nd Gen CFRP with rCF preforms.

Performance of  
rCF composites –  
Assessed with:

- Epoxy (dissimilar to Elium)
- Vinylster (similar to Elium)
- Urethane Acrylate (similar to Elium)

## The compatibility factor

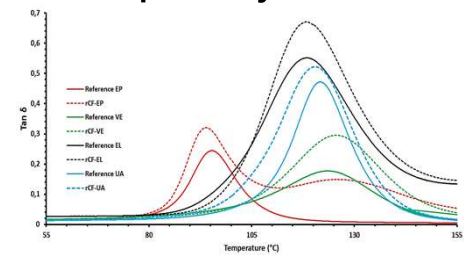


Fig. 4: tan  $\delta$  shows representative **compatibility** of the matrices.

## Bulk properties seems to differ

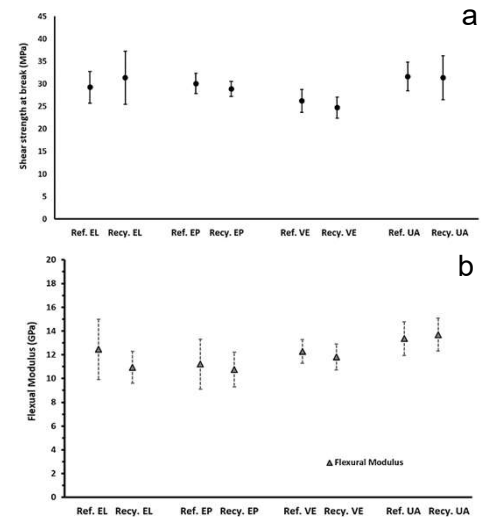


Fig. 5: Comparative structural performance of 1st and 2nd generation composites wrt a) **ILSS** and b) **Flexural Modulus**

## Answer lies at processing?

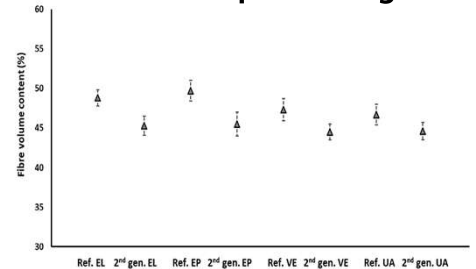


Fig. 6: Comparative fibre volume content of EL, EP, VE, and UA each reference vs. 2nd generation composites.

**Conclusion:** The **universal reuse of rCF** from recycled Elium CFRPs **seem feasible**. The interfacial and damping properties appear to have a lesser effect in influencing the bulk properties as compared to the fibre volume fraction. This shows that resin chemistry is likely not the ultimate factor in influencing the bulk properties of the rCF based 2nd gen composites.

**Acknowledgement:** Mr. Thomas Peter (Institute of Non Metallic Materials, TU Clausthal) for the SEM measurements.

This work was housed in the Composite Recycling group of Dr. S. Chakraborty (06.2019-03.2022) in PuK, TU Clausthal, Germany and part of the PhD thesis of Dr.-Ing. Magnus Gebhardt (04.2019-04.2021).



Full Paper: Gebhardt et al., Compos Comm, 2021, 28, 100974.

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