

## **Towards a closed loop recycling of CFRP within circularity concept processed with a novel thermoplastic matrix**

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Elium from Arkema is a relatively new thermoplastic resin system which can be processed and polymerised/cured like any other conventional epoxy systems – via infusion and at room temperature respectively. Being a thermoplastic system it offers the option of being recyclable. Using the method developed in-house to recover undamaged carbon fibre scrims [1], herein we explore separately i) the universal applicability of the recycled fibres in 2<sup>nd</sup> generation application with different resin systems [2] and ii) the reuse of pre-polymerized bulk Elium from production waste [3]. The effectiveness of both the above aspects is assessed using micromechanical investigations (single fibre push out tests) and flexural measurements (3 point bending). These tests have been carefully chosen to amplify the influence of the fibre-matrix interface and its influence on the bulk properties in composites processed with recycled/ recovered components. This demonstrates an overall pathway of not only reducing production waste, but also a varied application domain for fibres recovered from Elium based composites.

### **Reference:**

[1] Gebhardt et al., 'Closed loop room temperature recycling of CFRPs with an infusible thermoplastic matrix and its effect on 2<sup>nd</sup> generation properties', Journal of Plastics Technology, 2020, 16 (5), 180-210.

[2] Gebhardt et al., 'Towards a universal reuse of recycled fibres from Elium CFRPs through 2<sup>nd</sup> generation composites with various resin systems', Composites Communications, 2021, 28, 100974.

[3] Gebhardt et al., 'Reducing the raw material usage for room temperature infusible and polymerisable thermoplastic CFRPs through reuse of recycled waste matrix material', Composites Part B, 2021, 216, 108877.

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