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Annex III – Short public report. STSM

Title of the STSM: Tailored properties of Novel Acrylic/Glass Composites via Liquid Resin Healing at Elevated Loading Rates – Manufacturing and Testing

Name of the Applicant: Mohamad Alsaadi

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Beneficiary Institution: Technological University of the Shannon (TUS), and EireComposites Company (EIRE), Ireland.

Hosting Institution: Dresden University of Technology (TUD), Germany (TU Dresden) and University of Edinburgh/UK (U. Edinburgh).

Contact Name: Dr.-Ing. Andreas Hornig (TU Dresden) and Prof. Dr. Dipa Roy (U. Edinburgh).

Relevant Working Groups: WG3 and WG6.

Objectives / Description / Main outcomes (150-250 words)

This STSM investigated Mode I delamination in composite structures such as wind turbine blades (WTBs), focusing on high-velocity impacts and leading-edge erosion, which can induce tensile stresses and interface weakening. Triaxial glass fabric (U-E-1182 g/m²-1270 mm, Cristex), with four layers (+45/0/-45), was used as reinforcement for the recyclable Elium resin, which had an extended gel time, making it suitable for producing and repairing large components, such as WTBs and boats. Figure 1 presents the composite coupons (virgin) for the DCB tests (3, 6 and 9 mm/min). Figure 2 shows the repaired DCB coupons. Figure 3 shows the testing of virgin DCB samples. Figure 4 presents the testing of healed (tailored) DCB samples. Experimental results showed that all repaired samples outperformed the virgin ones in delamination load, not only at the standard crack opening rate (3 mm/min) but also at a higher crack delamination rate (9 mm/min). This behaviour can result in fracture toughness values related to crack initiation and propagation in the repaired samples that are higher than those of the virgin one. Fractographic evidence supported these findings, confirming the effectiveness of liquid thermoplastic resin injection as a healing method that enhances interlaminar ductility at repaired bond lines. The results of this study contribute to sustainability and reduced CO_2 emissions by increasing the life cycle of the composites. The work supports the deliverables of WG3 and WG6, advances the use of sustainable materials, and strengthens collaboration between European partners.

Figure 1: *The composite coupons (virgin) for the DCB tests (*3, 6 and 9 mm/min).

Figure 2. The repaired DCB *coupons*.

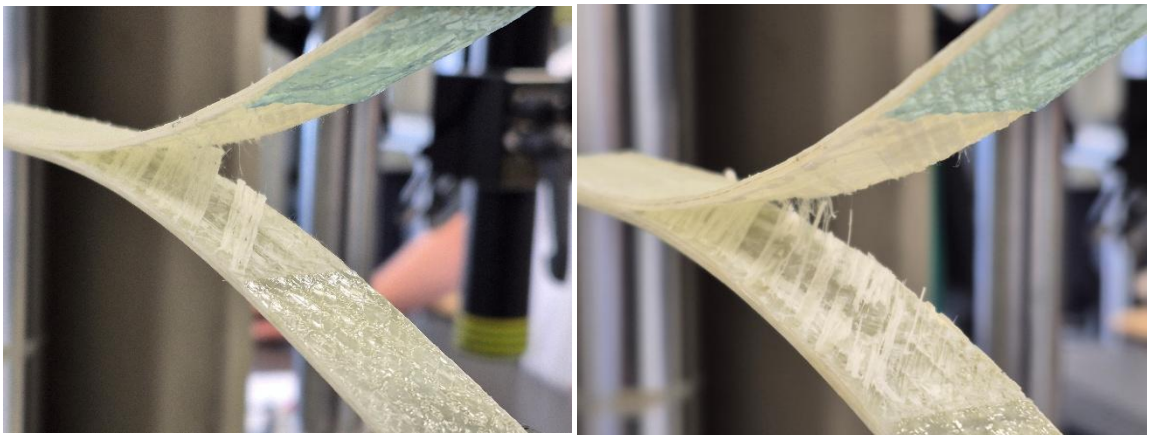

Figure 3: *Testing of v*irgin DCB *coupon*.

Figure 4: *Testing of healed* (tailored) DCB *coupon*.