

PhD Thesis

PhD Thesis: Circularity of thermoplastic Composite wound stRuCtUres through innovative material design, peeling-based disAssembly and Re-winding - starting scheduled in spring 2024

ANR-PRCI "CIRCULAR2"(2024-2027) - Partners: IPREM Pau, CANOE, INATECH Freiburg, Fraunhofer EMI.

Thesis context: Thermoplastic composite winding enables the manufacturing of lightweight tanks particularly suited for the transportation sector. Nevertheless, a classical recycling without downcycling of these structures made of valuable tapes made of continuous fibers embedded in a polymeric matrix is a major technical and economical challenge. In order to retain the value of the composite, the end-of-usage processing should preserve the continuity of the fibers to maximize the mechanical properties and maintain the fibers embedded in the matrix to simplify reuse. The aim of the project is to enable material circularity of thermoplastic composite wound structures through innovative material design, peeling-based disassembly and tape reprocessing using a holistic design for reuse approach. Two innovative design strategies will be investigated: (A) material-focused design ; (B) structure-focused winding design. The mechanical performance of reused peeled tapes will be determined after manufacturing. A multi-physics and multi-scale simulation tool will be developed to model the mechanisms involved during the different processes. Finally, the environmental footprint of the investigated strategies will be compared.

Thesis program will deal with the understanding of the phenomena of disassembly, then re-welding/re-healing of the interfaces between unidirectional tapes. The work will combine significant experimental developments, experimental campaigns and simulation.

Scientific Environment: The thesis will be based in Pau, IPREM Laboratory, under supervision of A. Barasinski, in partnership with CANOE (R&T platform) and periods in German labs will be organized during the project.

Duration and remuneration: This thesis will be funded for a period of 36 months. The gross monthly salary is €2,135.

Application: Please send by e-mail a CV, a cover letter and your M1 and M2 grades in a single PDF file named with your name to:

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