

# Development of recycled PET composites using Unidirectional Continuous fiber-reinforced

## thermoplastic tapes

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#### Introduction

Unidirectional tape (UD-tapes) materials offer some advantages for the manufacturing of structural components compared to the traditional organosheet format. UD-tape materials allow for the reduction of time cycle production and the amount of scrap material. Additionally, UD-tapes can be used to orient the fibers in any load direction, enabling the manufacturing of load-specific components at a minimum scrap rate, so its use allows the free orientation of the fiber and enhance the repeatability in complex geometries. The use of long fiber allows the increasing of the stiffness without losing impact properties, and therefore, conferring a higher specific modulus, higher mechanical resistance and an improvement of recyclability of the final product. Recycled polymers can be used as matrices and even as reinforcement fibres, thus resulting in a more sustainable solution. In the present study long fibre thermoplastic composites were developed from post-consumer recycled polyethylene terephtalate (r-PET) matrix reinforced with carbon fibre.

### Objectives

### Material development

The main objectives of this project were:

- Development of virgin and recycled
  PET 1/2" UD-tapes by melt
  impregnation process.
- Panel deposition by in situ consolidation (ISC) techniques using automated fiber placement (AFP) with fibre orientation of 0°/90° and laser assisted.



- Characterization of both UD-tapes and consolidated panels.
- Comparison between virgin and recycled thermoplastic composites.

#### RAW MATERIA

#### **CHARACTERIZATION**





#### Results

- The characterization of UD-tapes shows better mechanical properties for r-PET/LCF than with v-PET/LCF because of a stronger interphase.
- The fiber content was approximately 50% in both types UD-tapes.
- A good adhesion and impregnation



0 0,5 1 1, 0 1 2 3 4 5 Strain (%) Strain (mm)

between fiber and matrix in both cases was observed. This results implies an adequate flow index during their processability.

- Mechanical analysis of the panels show better properties of v-PET due to a less porosity found between layers.
- AFP with ISC techniques was validated for both materials.



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