

Study of processing/structure/properties relationships on aramid fiber at filament scale

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Aramid filament yarn

- Structural, mechanical and morphological properties
- Process impact
- Failure mechanisms

Abstract:

Technical fibers, and particularly the aromatic polyamide (commonly known as aramid), are frequently used as reinforcements in demanding applications. The processing conditions of aramid fiber strongly influence its response mechanisms once integrated into the final object. During twisting and thermal treatment steps, the fiber is subject to various thermomechanical stresses that modifies its properties.

The aim of this thesis is to understand how the fiber structure and its mechanical properties evolve during processing steps at filament scale. Mechanical characterization at the single fiber scale is challenging especially when the diameter is as small as 15 μm ; but it's essential to be able to optimize the performance of technical fibers in final object.

Fibers mechanical properties are linked to their highly oriented structure, therefor they are strongly anisotropic. Two major experiments will be used to study them: longitudinal tensile tests and single fiber transverse compression test. The physico-chemical characteristics of the fiber will be also investigated through various ways, e.g. DRX, TGA, DSC...

