Fractography and failure mechanisms in cfrp tubes submitted to burst testing

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The characterization of the failure mechanisms of CFRP components has been expanded as its demand for structural members in several applications increases.Composite tubular elements are used as biaxial structural components in applications where high mechanical performance per unit weight is a vital design requirement.In composite materials it is well known that the interface between fiber and matrix or interphases in those regions influences the overall composite properties.Crack propagation between plies (delamination) is the most commonly observed damage in CFRP since the fracture energy for cracking through the resin layer is lower than that for cracking through the fibers.Composite materials are known to display complex failure modes, typically involving multiple interacting damage processes, occurring over various length-scales. Fiber breaks occur in the micrometer range, whereas delaminations may occur over millimeter to meter scales, depending on the structure´s size and geometry.In recent years, quantitative fractography has become a method by which one can analyze the evolution of the interaction between crack and microstructure.Fracture morphology reveals that the dominant failure surface features were found to be fiber breakage, pull-out, and matrix cleavage and hackle formation resulting from interfacial tensile or shear failure.In the present work, specimens extracted from filament wound tubes subjected to burst test at room temperature were examined by optical and scanning electron microscopies in order to understand the failure mechanisms of such tubes.