# Strategies for improving fracture toughness of CFRP composite joints

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ABSTRACT

Lightweight materials have been more and more applicable for various purposes. As recently reported in [1], there will be a huge cost drop for carbon fiber applications which in turn will provide momentum for the fabrication of more carbon-fibers based composite structures. The classical mechanical fastenings, using rivets or bolts, have several drawbacks in joining composites. To bypass these disadvantages, the trend for using secondary bonding of carbon fiber reinforced polymer (CFRP) laminates adopting structural adhesives has attracted a lot of attention from the aerospace industry in recent times. However, in order to achieve strong and reliable joints, surface preparation has been identified as one of the most critical aspects of manufacturing.

Various novel surface preparation strategies are currently undertaken, including physical treatments such as plasma [2]. These treatments require the bonding area, i.e. the interface, to receive uniform treatment. However, recent developments indicated that introduction of interfacial heterogeneities or surface patterning, may leverage the work of fracture through enhanced crack trapping and/or mechanical interlocking between the mating substrates [3, 4].

Here we focus on the investigation of mechanical interlocking on the fracture behavior of adhesively bonded CFRP substrates. In particular, we analyze the effect of interfacial modifications at both micro- and macro-scale on the delamination resistance of aerospace grade CFRP laminates (HexPly M21/T700). Micro-scale modifications will be carried out using physical surface modifications techniques while the macro-scale morphology will be controlled with the aid of novel strategy based on the use of 3D printing.

**References**

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