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ASSESSMENT OF AUTOMATED CARBON FIBRES DEPOSITION TECHNIQUES TO PRODUCE CMC STRUCTURES

Abstract

Long fiber reinforcements represent an effective way to overcome reliability issues of monolithic ceramics hot structures. Indeed, carbon fibers ceramic matrices composites (CMC) like C/C and C/SiC exhibit higher damage tolerance with respect to monolithic ceramics, an advantage that makes them an ideal choice for structural thermal protection systems (also called hot structures). If compared to tile based thermal protections, these systems are load bearing, and take advantage of other fundamental requirements for. re-entry vehicles such as: refractoriness and damage tolerance,. Just like in carbon fibres reinforced plastics, long fibers reinforced ceramic structures mechanical efficiency directly derive from a proper CMC design. When realizing non planar geometries, like nose cone structures, it is extremely difficult to keep the continuity of the fibers reinforcement, hazarding the final structural properties of the component. The objective of this paper is to assess a novel approach to carbon fibres placement for CMC performs manufacturing, based on automated deposition techniques conventionally employed in the manufacturing of polymer composites. The approach has been demonstrated with the manufacturing of two C/SiC nose cone, obtained by carbon fibres winding deposition onto a Si-SiC foam mandrel, and then by its final ceramization. The obtained technological demonstrators are then bound to be tested in a arc-jet facility.