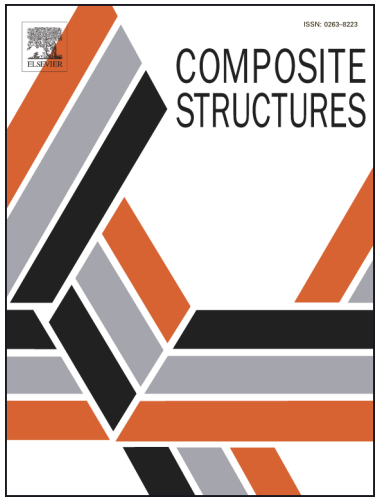

Interaction between nacre-like CFRP mesolayers and long-fibre interlayers

F. Narducci, S.T. Pinho

PII: S0263-8223(18)31188-7
DOI: https://doi.org/10.1016/j.compstruct.2018.05.103
Reference: COST 9742

To appear in: *Composite Structures*

Please cite this article as: Narducci, F., Pinho, S.T., Interaction between nacre-like CFRP mesolayers and long-fibre interlayers, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.05.103

Interaction between nacre-like CFRP mesolayers and long-fibre interlayers

F. Narducci[a,*], S. T. Pinho[a]

[a] *Department of Aeronautics, Imperial College London, South Kensington Campus, London SW7 2AZ, United Kingdom*

Abstract

In this paper, a carbon-fibre/epoxy (CF) composite with nacre-inspired tiled micro-structure is designed and synthesised. The aim is to investigate the interaction between the CF discontinuous micro-structure and continuous glass-fibre/epoxy (GF) layers, which are intended to act as crack stoppers, similarly to the organic interlayers that separate layers of ceramic tiles in natural nacre. Firstly, we use a GF skin to trigger unstable failure in nacre-like mesolayers, and show how the damage mode in the latter changes from pull-out to brittle fibre fracture due to the interaction with the GF skin. Secondly, we demonstrate how continuous GF interlayers can succeed in arresting unstable crack propagation in the nacre mesolayers. Furthermore, we show that they can also change the morphology of damage in the nacre, promoting a transition from brittle tile fracture to more damage-tolerant tile pull-out.

Keywords: Microstructures, Fibre-reinforced composite material, Nacre, Fractography, Biomimetics

1. Introduction

Composite structures are being increasingly used in the aerospace and automotive industry due to their high strength-to-weight and stiffness-to-weight ratios, with respect to steel and aluminium alloys. In particular, Carbon-Fibre Reinforced Polymers (CFRP) have been widely identified as a material of choice for lightweight applications, such that the weight percentage of CFRP in modern aircraft models has reached over 50%. However, one of the main limitations to further extending the use of these materials is their inherent brittleness, which results in the difficulty to design damage-tolerant lightweight structures.

*Corresponding author
Email address: f.narducci14@imperial.ac.uk (F. Narducci)