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Deployable, Shape Memory Carbon Fibre Composites Without Shape Memory Constituents

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Abstract

Trials have been conducted to investigate the shape memory capability of an interleaved composite consisting of carbon fibre reinforced epoxy laminae and polystyrene interleaf layers. It has been shown that the composite can be readily re-shaped by deforming it at an elevated temperature and then cooling the composite in the deformed state. On re-heating, the composite almost fully returns to its original shape. One potential application of the shape memory capability of the interleaved composite is in deployable structures and a simple structure has been manufactured to demonstrate this possibility.

1. Introduction

1.1. Carbon fibre laminates containing thermoplastic interleaf layers

Composites reinforced with polymer-coated fibres and interleaved composites were initially investigated for their improved impact performance and interlaminar toughness [1-4] but more recently several of the authors of the current paper have been developing and investigating these types of composites to exploit their potential to exhibit controllable stiffness [5-9]. Controllable stiffness materials possess stiffness that can be changed on demand. The mechanism for the stiffness control in the interleaved