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Ultrasonic welding of carbon/epoxy and carbon/PEEK composites through a PEI thermoplastic coupling layer

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Abstract

This paper investigates welding of carbon/epoxy and carbon/PEEK composites using the following procedure. Firstly, the carbon/epoxy composite was made "weldable" through a very thin PEI thermoplastic film co-cured on its surface. During the curing cycle, the PEI resin and the components of the epoxy resin system partially diffused into each other generating a gradient interphase between the original epoxy and PEI resins. Subsequently, the carbon/PEEK composite adherend was welded onto the PEI-rich surface of the weldable carbon/epoxy adherend, exploiting the total miscibility between PEI and PEEK. Thermal degradation of the carbon/epoxy adherend during the welding process was avoided via the ultra-short heating times enabled by the ultrasonic welding technology. In this research, mechanical testing was used to evaluate the weld strength relative to reference joints. Additionally, cross-section scanning electron microscopy was used to assess the morphology of the PEI/epoxy interphase before and after the welding process.

Keywords: A.Thermoplastic resin, A; Thermosetting resin; A. Polymer-matrix composites (PMCs); E. Joints/joining

1. Introduction

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