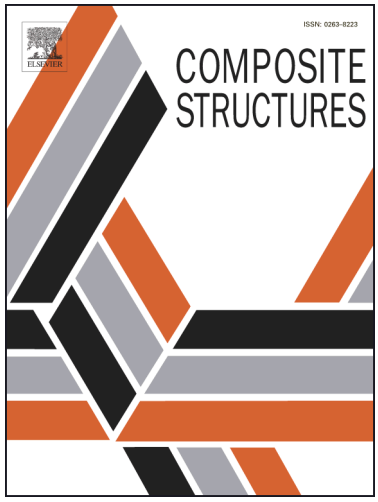

Damage mechanisms assessment of hybrid flax-glass fibre composites using acoustic emission

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Damage mechanisms assessment of hybrid flax-glass fibre composites using acoustic emission

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Abstract

This work presents an assessment of the damage mechanisms occurring during tensile tests in hybrid flax-glass fibres reinforced epoxy composites. The samples were composed of twill flax and glass fibre laminate plies with different stacking sequences and subjected to water immersion at 55°C. The Acoustic Emission (AE) technique combined with scanning electron microscopy observations was used to identify the typical damage mechanisms and to follow their evolution. This identification was made with a statistical multivariable analysis in which the number of parameters and classes was optimised. Finally, the participation of each damage mechanism to the global failure was evaluated from the hits number and AE energy. The AE results showed that, although the hits number associated with the fibre failure was the lowest, their contribution to the overall failure of composites became predominant regarding the cumulative of AE energy. Furthermore, an additional group of AE signals induced by the delamination between flax and glass fibre layers was detected for the aged hybrid laminates.

Keywords: Natural fibre composites; Hybrid; Mechanical properties; Acoustic emission; Damage mechanisms

1. Introduction

With the increase of environmental awareness from the researchers, more attention is diverted to the use of polymers reinforced lignocellulosic fibres such as flax, jute, hemp and sisal. Indeed, the use of these fibres as reinforcement of polymer matrix composites have been the subject of many comprehensive reviews in the last decades [1-3]. Due to their low density, the specific mechanical properties of natural fibres were rather higher than those of synthetic fibres in particular of glass ones. In addition to that, their easy availability, biodegradability, non-abrasivity, renewability and eco-friendly

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