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The Effect of CNT-Reinforced Polyurethane Foam Cores to Flexural Properties of Sandwich Composites

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Abstract

In foam cored sandwich composites, it is crucial to understand micromechanical characteristics of foam in relation with its properties to understand synergetic effects of adding nanomaterials such as CNTs. In this study, effects of CNT dispersion and distribution on cell morphology and foamability of rigid polyurethane (PU), which is directly related to micro-structure and mechanical performance of overall structures were investigated. Raw and functional CNTs were added to rigid polyurethane foams up to 0.2 wt.% and their compressive strength is evaluated. The results showed that dispersion media such as PMDI with low viscosity revealed a better CNT dispersion and resulted with an enhancement of 13% in compressive strength compared to neat PU foams. This enhancement in foam core properties reflected in sandwich composites with an enhancement around 30% in both core shear and face ultimate strength. Hence, core shear found to be the common failure mechanism for all sandwich composites

1 Introduction

Overcoming the challenges of conventional honeycomb core material with a higher surface area, polymer foam cores can spread the impact, distribute the loads and stresses more effectively and increase the strength of sandwich structures with very low density eliminating moisture absorption and delamination of face sheets[1]. These cores also enable better