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Hygroscopic ageing of nonstandard size sandwich composites with vinylester-based composite faces and PVC foam core

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Abstract

This paper aims to assess the hygroscopic behaviour of nonstandard size sandwich composites constituted of thick Electronical-Chemical Resistance (ECR) glass fibre reinforced vinylester composite faces bonded to closed-cell Polyvinyl Chloride (PVC) foam core in the service environment as a reference and basis for materials selection. In order to exhibit the change of sandwich composites properties in realistic environment, the specimens fabricated by Vacuum Infusion Moulding Processing (VIMP) were immersed in two humid conditions: seawater with 30°C (SWL) and purewater with 80°C (PWH) for 1680 hours. The moisture uptake and various mechanical properties of specimens, including the flatwise tension strength, flatwise compressive strength, in-plane shear strength, shear strength using short beam bending and edgewise compressive strength were tracked periodically. The results from water absorption measurement indicate that the specimens immersed in two humid conditions reach saturation levels after immersion of 1008 hours, and non-Fickian and Fickian diffusion occur simultaneously. The characterization on mechanical properties was mainly placed on the variation of PVC foam core and faces-core interface properties, and corresponding results reveal that the moisture absorption has insignificant effects on the PVC foam core properties but appreciably affects the composite faces and face-core interface properties, especially for the specimens immersed in PWH.

Keywords

Hygroscopic, vinylester, sandwich composites, moisture uptake, PVC foam core

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