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# Hygrothermal viscoelastic material characterisation of unidirectional continuous carbon-fibre reinforced polyamide 6

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## Abstract

This paper presents results of material characterisation experiments on the hygrothermal viscoelastic behaviour of unidirectional laminates of continuous carbon-fibre reinforced polyamide 6. The material behaviour when subjected to the automotive painting process is of interest. Coefficients of thermal- and -moisture expansion were determined from dilatometer experiments and micrometer measurements together with weighing, respectively. Diffusion coefficients were generated from thermogravimetric analysis and fitted with the Arrhenius equation. Dynamic mechanical analysis and digital image correlation of quasi-static tensile tests were performed to obtain a relaxation curve and a major Poisson's ratio, respectively. The Williams-Landel-Ferry equation was fitted to the time shift factors.

*Keywords:* A. Carbon fibre, A. Thermoplastic resin, B. Thermomechanical, B. Rheological properties, X. Hygroscopy

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## 1. Introduction

The application of composite materials in the body structure of passenger vehicles has seen a gradual increase over the past few years due to the efforts made in the automotive industry to restrain the trend of increasing kerb weight [1, 2, 3]. Structural composite parts in the automotive industry most often feature a thermoset matrix due to lower raw materials costs in comparison to a thermoplastic equivalent [4]. However, legislative changes to the requirements

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