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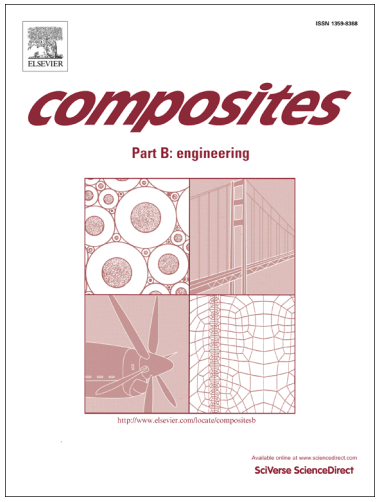

Fire resistance characterisation of hemp fibre reinforced polyester composites for use in the construction industry

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Fire resistance characterisation of hemp fibre reinforced polyester composites for use in the construction industry

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Abstract

This paper presents research pertaining to the fire performance of natural fibre reinforced polymer composites (NFRP). Hemp fibre has been selected as representative of natural fibres used for reinforcement in NFRPs. The fire performance has been examined by a bench scale test method which provides an indicative assessment of the likely performance in full-scale fire resistance tests which are required for materials to meet building standards in the UK. It has been verified in this research that hemp fibres contribute to a thermally resistant char layer in polyester composites. There is an increase in thermal resistance of the char layer at high temperatures with an increase in fibre volume fraction. Ignition is delayed with an increase in fibre volume above 25%. Mechanical degradation occurs at relatively low temperatures which may be associated with the decomposition of hemicellulose and lignin. The desirability of NFRPs in terms of fire performance increases with an increase in fibre volume fraction and material thickness. Untreated hemp fibre reinforced polyester composites in this study have been characterised as having poor fire resistance and would not be expected to pass a full scale fire resistance test in their current state.

Keywords: A. natural fibres, A. Thermosetting resin, B. Thermal properties, D. Thermal analysis, D. Mechanical testing

1 Introduction

Natural fibre reinforced polymers (NFRP) have been identified as an alternative to glass fibre reinforced polymers (GRP) for use in the construction industry, potentially offering a lower environmental impact. GRPs