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Mechanical and water absorption properties of resin transfer moulded kenaf fibre reinforced composites

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ABSTRACT

This investigation focuses on the tensile, flexural, impact and water absorption properties of kenaf fibre reinforced composites manufactured by resin transfer moulding. Varying processing conditions and resin system are considered as alternatives to fibre treatments, thereby potentially avoiding additional cost and complexity in the manufacturing process. Tensile, flexural, impact and water absorption tests were conducted. Composites were produced with fibre volume fractions of 15 %, 22.5 % and 30 %. Fibre moisture content, mould temperature and mould pressure following injection were altered in polyester composites. Processing conditions were found to have little effect on properties except for pressurisation which increased tensile and flexural strength and decreased water absorption at low fibre volume fractions. Vinyl ester and epoxy composites were compared to those made using polyester resin. The results revealed that properties were affected in markedly different ways by the resin system and the fibre volume fraction. Polyester composites show good modulus and impact properties, epoxy composites display good strength values and vinyl ester composites exhibit good water absorption characteristics. Scanning electron microscope studies show that polyester composites fail by fibre pull-out, epoxy composites by fibre fracture and vinyl ester composites by a combination of the two. Theoretical models were applied to composites made using all three resin systems. There was good correlation with measured values of tensile linear moduli and flexural strength but poor correlation with measured values of tensile strength, tensile secant moduli and flexural secant and linear moduli. A comparison between kenaf and glass composites revealed that the specific tensile and flexural moduli are comparable at low fibre volume fractions. However, glass composites have much better specific properties than the kenaf composites at high fibre volume fractions for all three resin systems.