Sign In | My Tools | Contact Us | HELP

SAGE journals online Search all journals Advanced Search Search History Browse Journals

Universidade do Minho

Mechanical Properties of Composite Materials Made of 3D Stitched Woven-knitted Preforms

Hong Hu

Institute of Textiles and Clothing, The Hong Kong Polytechnic University, Hong Kong, tchuhong@polyu.edu.hk

Mingxing Zhang

College of Textiles, Donghua University, Shanghai 201620, China

Raul Fangueiro

School of Engineering, University of Minho, Guimaraes, Portugal

Mario De Araujo

School of Engineering, University of Minho, Guimaraes, Portugal

Abstract

This article presents an experimental investigation carried out to understand the mechanical behavior of composite materials made of 3D stitched woven-knitted basalt fabrics. The innovative preforms used consist of two outer layers of a plain woven fabric combined with two inner layers of weft-knitted fabrics. The weft-knitted fabrics selected for the study were varied plain knit, 1 × 1 rib, Milano, and interlock. The fabric layers were stitched together with Kevlar yarns. These 3D stitched preforms were impregnated with polyester resin using resin transfer molding, and the corresponding composites obtained were tested under tensile, bending, and impact loads. The results obtained show that the type of knitted structure significantly influences the mechanical performance of the 3D stitched woven-knitted composites. The composite using interlock structure as the inner layers has the best results concerning energy absorption and tensile strength. The varied plain knit structure has proved to be the best suited to impart stiffness as it provides the highest Young's modulus among the above four knitted structures.

3D stitched woven-knitted preforms mechanical properties impact behavior textile composites