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Experimental evaluation of static and dynamic properties of low styrene emission vinylester laminates reinforced by natural fibres

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Abstract. The aim of this experimental investigation is to perform a thorough analysis in terms of mechanical properties of thermoset composites built with an eco-friendly resin and reinforced by natural fibres. Flax and basalt were the reinforcements selected, being applied both in single and hybrid layouts with a low-styrene emission (LSE) vinylester matrix, and glass synthetic fibre composites were also studied for comparison purposes. Tensile, flexural and low-velocity impact tests were carried out according to their respective ASTM standards, showing that basalt and flax laminates are respectively the strongest and the weakest materials analysed, where the hybrid composition offers similar tensile and flexural moduli to glass, being 30% stronger in tension and 10% in bending. Impact tests performed at a same shock energy of 30.6 J perforated glass fiber specimens, while small indentations were noticed in naturally reinforced coupons characterized by fiber tensile breakage and matrix compressive failure regions.

Keywords: Polymer Composites; Mechanical properties; Flax; Basalt; Hybrid.

1. Introduction

Currently, huge efforts in research activities, both from industry and academia, are dedicated to find proper solutions to minimize the environmental impact in the production and use of composite materials [1]. Congruently to most industrial segments nowadays, in this sector sustainability represents a key aspect for developing novel products and processes. Some examples [2] can be found in the construction sector in the usage of basalt as an aggregate for the production of concrete [3] or as a thermal insulator [4]; or even in the automotive with the

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