

Study of the resin type effect on composite specimens cut from elaborated tubes using filament winding technique subjected to bending loading

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Abstract – Carbon dioxide emissions due to fossil fuels cause environmental problems, global warming and climatic change, hence the need to replace them with renewable energy sources is necessary and among the solutions is the use of hydrogen. The difficulty in using hydrogen does not lie in its production but rather in securing its transport by canalization and storage in tanks because a simple leak will cause an explosion. At the present time, both industrials and researchers are trying to replace conventional pipes made of very heavy metallic steel, which have corrosion problems and costly maintenance, by pipes made of very light composites, having a long life time and low maintenance due to the fact that they are non-metallic (i.e. do not have corrosion problems). The use of composite pipes contributes to the reduction of their cost prices and installation costs. In this perspective, the present study focuses on the design and manufacturing, by the filament winding technique, of composite tubes having the same type of twisted natural fiber but two types of polyester resins, supplied by two different manufacturers, have been used. Test specimens were cut from the elaborated composite tubes in their longitudinal direction according to the ASTM D790-17 standard and then tested in 3-point bending with a speed of 5 mm/min using a Walter & Bai tensile machine. It is important to note that the specimens were both on their concave faces and on the convex one. The obtained stress/displacement response curves allowed to determine the mechanical properties, namely the stress, the Young's modulus and the displacement at break. In addition, for both types of polyester resin, the resistances of the specimens tested on their external faces were higher than those tested on their internal ones.

Keywords – Composite tubes, Bending, Filament winding, Natural fiber, Polyester resin

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