Tensile properties of hybrid biocomposite reinforced epoxy modified with carbon nanotube (CNT)

ABSTRACT

A tensile test was conducted to investigate the mechanical properties of hybrid bio-composites that have potential for application in helmet shells. Helmets can protect users from serious injuries, reducing traumas and deaths. Military helmets are made with 19 layers of Kevlar, and bicycle helmets are made of glass fibre reinforced plastic materials that are costly. Replacing or reducing these synthetic fibres with plant fibres would reduce costs and may allow for such materials to be recyclable, biodegradable, and more abundant, as the material has been ground or crunched. Flax woven fibre was used to fabricate one panel of composite (Flax only) and three panels of hybrid composite (FLXC, FLXG, and FLXK). In this project, the epoxy resin was modified by weight with 0 wt.%, 0.5 wt.%, 1 wt.%, 1.5%, and 2 wt.% multi-walled carbon nanotubes (MWCNTs). This study examined the effect of multi-walled carbon nanotube (MWCNT) concentration on the tensile properties of hybrid biocomposites. The experimental results suggested that the MWCNTs played an important role in improving the mechanical performance of hybrid biocomposites. It was found that optimum carbon nanotube (CNT) concentration improved the tensile performance of the materials by 2% to 5%. However, an excess CNT concentration led to the deformation of materials and reduced their mechanical performance.

Keyword: Carbon nanotube; Hybrid biocomposites; Tensile properties; Flax fibre; Glass fibre; Aramid fibre; Carbon fibre