Processing of sandwich composite structures consisting of woven GFRP skins and a jute mat core by hand lay-up technique

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Abstract:

This research investigates the processing of sandwich composite structures with overall low density made up of glass fibre-reinforced polymer skins bonded to a jute fiber mat core. Jute fibers are totally biodegradable and recyclable materials, i.e. environmentally-friendly materials. Jute fibers have good insulating properties for both of thermal and acoustic energies with moderate moisture regain and no skin irritations. The current annual worldwide production of jute fibre is about 3.2 million tones used for various applications. Bag cloth industry is the biggest consumer of jute fibers available in the markets. Jute bags have gained an advantage as being an eco-friendly option instead of both of non-biodegradable poly bags that are made from petroleum and paper bags that require large quantities of wood. A huge amount of these jute fibers is wasted and goes to landfill every year, either scraped from manufacturing of jute cloth in form of slivers or end-of-life of jute bags. Therefore, an attempt was carried out in this research to use the above-mentioned valuable properties of jute fibers, to reuse the wasted jute slivers, to recycle the end-of-life jute bags for fabricating highly valuable sandwich structured composites. The sandwich composite structures are usually fabricated by attaching two thin but stiff skins to a lightweight but thick core. The jute fibre slivers were blended with chopped jute fibers that obtained from hashing the used coffee grain bags to produce a lightweight thick jute fiber mat. This jute fiber mat was padded as core material between two stiff thin skin layers. Each skin layer is constructed from a single plain woven glass fiber fabric impregnated with unsaturated polyester resin by hand lay-up technique. Finally, a lightweight sandwich composite structure with reduction of cost and CO2 emission was successfully fabricated. Appropriate applications can be introduced for these sandwich composite structures as barrier walls against the thermal and acoustic energies for interior construction, lightweight panels for furniture construction, housings for electronic equipments, etc.

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