KENAF LAMINATED BIOCOMPOSITE FOR PROSTHETIC LEG SOCKET FABRICATION

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Figure 1: Prosthetic leg socket made of kenaf laminated composite

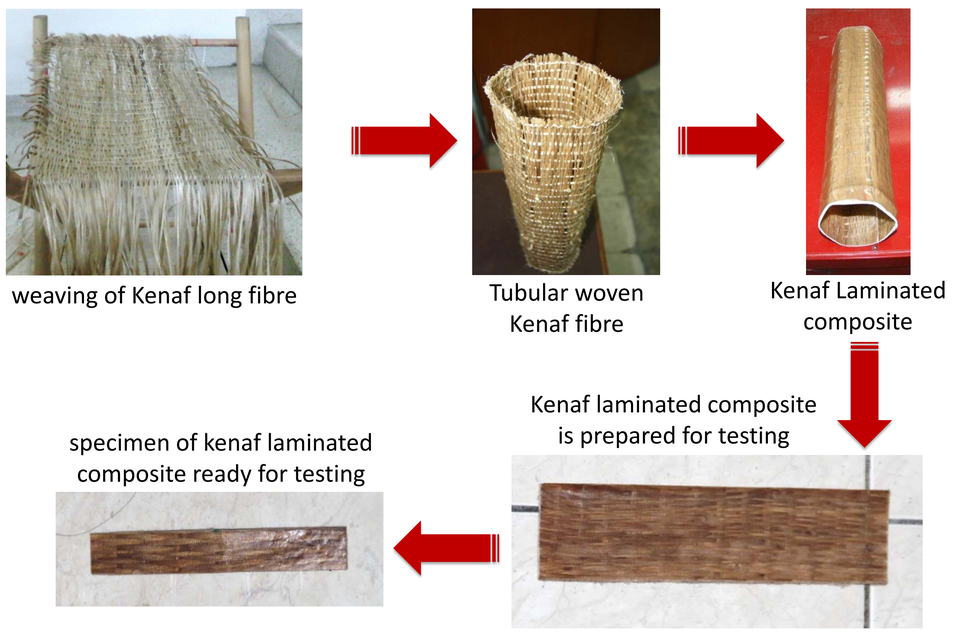

Figure 2: Preparation of Kenaf laminated composite for testing

INTRODUCTION OF TECHNOLOGY

Artificial limbs may be needed for a variety of reasons including disease, accidents, and congenital defects. As people's bodies change over time, due to growth or change in body weight, the artificial limbs have to be changed periodically or adjusted by time. This constant need to change becomes costly if the material used is expensive. This study emphasized on the sockets part of prosthetic leg, since they are required to be replaced due to wear and tear, biological growth, as well as to maintain the comfort of wearers. Presently, socket of prosthetic leg is made of Glass Fibre Reinforced Plastic (GRFP). Alternative way to produce cheaper prosthetics is needed to ensure that low-income wearers could afford the same necessity.

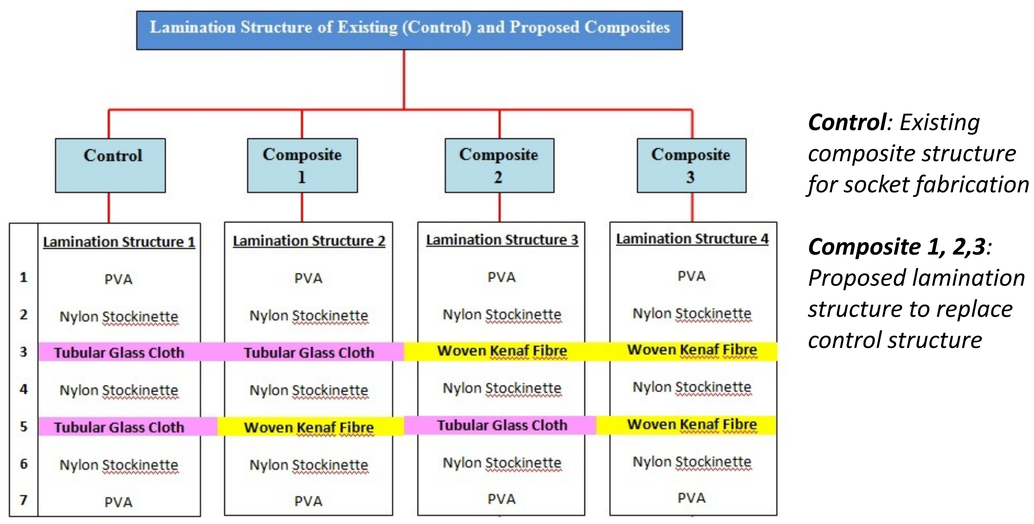

Figure 3: Control and Proposed Laminated Woven Kenaf Composites

INVENTION

The laminated woven kenaf composites were produced to compare with the existing lamination structure (of prosthetic leg socket) in terms of their mechanical (tensile, flexural and impact) and physical (density and moisture content) properties in identifying both strengths and weaknesses. These composites were prepared using sandwich layering or lamination technique – a similar technique used to fabricate sockets of prosthetic legs. The preparation of samples of Kenaf laminated composite for the physical and mechanical tests is shown in Figure 2.

One or two layers of woven kenaf fibre is used, depending on the lamination structure (Figure 3), as the replacement for glass fibres in the production of the prosthetic leg socket. Prototype of a complete prosthetic leg set, with the socket made of kenaf laminated biocomposite (Figure 1) was produced to show the feasibility of the invention.

ADVANTAGES

The incorporation of kenaf fibre in the existing composite structure has resulted in:

- Improvement of the mechanical and physical properties
- Reduction of the total cost to produce prosthetic leg socket
- Biodegradable material, thus less harmful to the environment

MARKET POTENTIAL

Sockets represent at least 20% of the total cost of a prosthetic leg. The low cost yet compatible quality of prosthesis is highly required by many manufacturers. The study has proven that kenaf-based composite has the qualities to replace the existing material for prosthesis industry, especially in prosthetic leg socket production. Kenaf fibre is also relatively chapter than synthetic fibres such as glass and carbon fibres, due to its abundance of availability. Locally-made prosthesis using local material could economically save the flow of money exchange out of the country.

Consumer/End User

- Artificial limbs users/wearers.
- Orthotics users/wearers.

Industry

- Prosthesis and orthotics industry
- Rehabilitation Centre
- Hospitals or any health institutions

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