Mechanical Behavior of sisal , bamboo, Epoxy Reinforced Natural Composite

ABSTRACT

Now-a-days, the natural fibres from renewable natural resources offer the potential to act as a reinforcing material for polymer composites alternative to the use of glass, carbon and other man-made fibres. Among various fibres, jute is most widely used natural fibre due to its advantages like easy availability, low density, low production cost and satisfactory mechanical properties. For a composite material, its mechanical behaviour depends on many factors such as fibre content, orientation, types, length etc. Attempts have been made in this research work to study the effect of fibre loading and orientation on the physical and mechanical behaviour of jute/glass fibre reinforced epoxy based hybrid composites. A hybrid composite is a combination of two or more different types of fibre in which one type of fibre balance the deficiency of another fibre.

Composites of various compositions with three different fibre orientation (0°, 30° and 40°) are fabricated using simple hand lay-up technique. It has been observed that there is a significant effect of fibre loading and orientation on the performance of sisal and bamboo reinforced epoxy based composites. The developed composites undergo different kinds of tests. The result shows hybrid composites having good strength and stiffness compared to natural hybrid composites

Keywords: Renewable, Mechanical Properties, Orientation

INTRODUCTION

Mankind has been aware composite materials since several hundred years before Christ and applied innovation to improve the quality of life. Although it is not clear has to how Man understood the fact that mud bricks made sturdier houses if lined with straw, he used them to make buildings that lasted. Ancient Pharaohs made their slaves use bricks with to straw to enhance the structural integrity of their buildings, some of which testify to wisdom of the dead civilization even today. Contemporary composites results from research and innovation from past few decades have progressed from glass fibre for automobile bodies to particulate composites for aerospace and a range other applications.

Ironically, despite the growing familiarity with composite materials and ever-increasing range of applications, the term defines a clear definition. Loose terms like “materials composed of two or more distinctly identifiable constituents” are used to describe natural composites like timber, organic materials, like tissue surrounding the skeletal system, soil aggregates, minerals and rock. Composites that forms heterogeneous structures which meet the requirements of specific design and function, imbued with desired properties which limit the scope for classification. Reinforcing materials generally withstand maximum load and serve the desirable properties. Further, though composite types are often distinguishable from one another, no clear determination can be really made. The demands on matrices are many. They may need to temperature variations, be conductors or resistors of electricity, have moisture sensitivity etc. This may offer weight advantages, ease of handling and other merits which may also become applicable depending on the purpose for which matrices are chosen. Solids that accommodate stress to incorporate other constituents provide strong bonds for the reinforcing phase are potential matrix materials. A few inorganic materials, polymers and metals have found applications as matrix materials in the designing of structural composites, with commendable success. These materials remain elastic till failure occurs and show decreased failure strain, when loaded in tension and compression.

Composites cannot be made from constituents with divergent linear expansion characteristics. Choice of fabrication method depends on matrix properties and the effect of matrix on properties of reinforcements.

It is desired to produce low cost, high quality, sustainable and environmental friendly materials. It has been found from the researched study that the lower mechanical properties and poor compatibility between polymer matrix and fibers. Composite materials are one of the most favoured solutions to this problem in the field. By combining the stronger properties of traditional materials and eliminating the disadvantages they bear, fiber mats of different orientations are developed, composite materials technology is providing compromising solutions and alternatives to many engineering fields. Problems born from material limitations like heavy weight, structural strength, and thermal resistance are being solved by the composite material alternatives, and many more alternatives are being introduced to readily use engineering applications.