1.1 INTRODUCTION

The general tendency of man is to lead a comfortable life. For that he needs newer and useful materials. Quest for the new materials has been going on since times immemorial. Many new materials have been developed in the 20th century. Composite is one such material which has revolutionized the concept of high strength.

A composite is a material made by combining two or more dissimilar materials in such a way that the resultant material is endowed with properties superior to any of its parental ones. Unlike the components of a chemically synthesized compound, the components of a composite neither take part in a chemical reaction nor do they dissolve completely or merge with one another. Nevertheless, they remain strongly bonded together while maintaining an interface between each other and act in concert to give a much improved performance.
Composites are not new to mankind. Probably the first composite was made in biblical times when man added chopped straw to clay to make stronger bricks. The steel rod reinforced concrete widely used in modern buildings is also an example of composite.

As man's understanding of nature increased, and he dug deeper into the treasure trove that nature offered, a host of new materials have become available to him. But with the inexorable march of civilization, man has felt the need for more novel materials. As the proverb says "Necessity is the mother of invention", and to meet his ever increasing, diversifying and complex needs, man has started fabricating new materials from a judicious combination or manipulation of materials already available.

The tremendous progress in science and technology brought about the Industrial Revaluation in the 19th century. As this revolution progressed and encompassed every aspect of human life, be it travel, work or play, an increasing need was felt for materials capable of resisting fatigue, environmental corrosion, pressure, stress and exposure to chemicals. They also have to be adaptable for use under extreme temperature variations. Newer and more versatile materials in the form of composites were evolved as an answer to this need. Their emergence has a tremendous impact in several fields like transportation, marine engineering, chemical equipment and machinery, construction, electrical and electronic equipment, space technology, sports goods and medical engineering. The aerospace and defence industries were also benefited greatly from the light-weight yet extremely hard composites that have evolved a lot. These alternatives to
traditional materials took the industry by storm. Composites manufacturing is one of the fastest growing industries with the United States being the major consumer of these materials. The global consumption of composites is now around two million tons annually and is growing at the rate of ten percent [1] every year. In 1995, the advanced composite materials found a major market in aerospace field to the tune of 67% followed by sports (16%) and automobiles industry (14%). The field-wise distribution of the consumption of the advanced composite materials is shown in Figure 1.1.

Composites are materials based on the controlled distribution of one or more materials, termed as reinforcement, in a continuous phase of a second materials, called the matrix. The reinforcement is added to provide strength and stiffness to a composite. The matrix is also known as 'Binder' material. Its function is to make the composite resistant to degradation.

The ultimate performance of a composite depends not only on the matrix and reinforcement but also on the matrix-reinforcement interface. The interface is critical part of the composite technology and fabrication techniques [2-4]. It is controlled by a third material called coupling agent or compatibiliser. Alkyl salines, organo titanates, high molecular weight carboxylic acids and esters etc., are some of the coupling agents. These coupling agents have two different functional groups, one is attracted to the resin and the other to the surface of the filler [5]. However, when both the matrix and fibre
Fig. 1.1 Field-wise distribution for the consumption of the advanced composite materials.
are organic in nature, greater bonding is expected between these components and as a result coupling agent is generally not required [1].

1.2 NATURAL FIBRE - POLYMER COMPOSITES

A number of scientists tried to develop different types of composites by combining various resins with natural fibres [6-16]. Apart from sisal, other natural fibres jute, coir, banana, and bamboo fibres were also used for the development of polymer composites [17-23]. Several reports were published in the literature on the development of natural fibre-thermoplastics [24-32].

In order to select the components for fabricating the composites, it is customary to test their performance. Keeping this in mind the author tested the performance of the blend he developed as matrix and the natural fibre fabric "Hildegardia Populifolia" materials.

1.3 AIM AND SCOPE OF PRESENT WORK

Tough polymers are serving society to the maximum extent, simultaneously they are posing some environmental problems due to their non-judicious uses. The main problem with most of the polymers is their non-degradable nature. It is the primary duty
of all scientists in general and polymer scientists in particular to see that the environment is not polluted by the polymers. Keeping these things in mind the author planned to test the performance of the reinforcement and the matrix. Natural fibres are biodegradable. The author selected the blend of thermosetting epoxy resin and thermoplastic polycarbonate as matrix. The author selected the natural fibre, as it is widely available in Kadiri area of Anantapur district which is about 90 Km from Sri Krishnadevaraya University. Hildegardia is a composite by itself in which the fibres are held together by lignin binder. The author treated the Hildegardia fibre with alkali solution in order to remove the lignin and grease before use. The author used a blend as the matrix because the polycarbonate is toughening agent. As epoxy is a brittle matrix, the author wanted to improve its property by incorporating the toughening component in it.

The author also prepared a second blend of Epoxy/PMMA and tested its performance. The performance of the blend depends on the miscibility of its components. The author studied the miscibility of the two polymer blends developed employing viscosity, ultrasonic velocity, and refractive index techniques. As a continuation of this work, the author wants to develop in future the green composites using the matrix materials developed and the natural fibre procured by him.
REFERENCES


