

INTRODUCTION

1.1 Overview of composites

The advantage of composite materials over conventional materials stem largely from their higher specific strength, stiffness and fatigue characteristics, which enables structural design to be more versatile. By definition, composite materials consist of two or more constituents with physically separable phases. However, only when the composite phase materials have notably different physical properties it is recognized as being a composite material. Composites are materials that comprise strong load carrying material (known as reinforcement) imbedded in weaker material (known as matrix). Reinforcement provides strength and rigidity, helping to support structural load. The matrix or binder (organic or inorganic) maintains the position and orientation of the reinforcement. Significantly, constituents of the composites retain their individual, physical and chemical properties; yet together they produce a combination of qualities which individual constituents would be incapable of producing alone. The reinforcement may be platelets, particles or fibers and are usually added to improve mechanical properties such as stiffness, strength and toughness of the matrix material. Long fibers that are oriented in the direction of loading offer the most efficient load transfer. This is because the stress transfer zone extends only over a small part of the fiber-matrix interface and perturbation effects at fiber ends may be neglected. In other words, the ineffective fiber length is small. Popular fibers available as continuous filaments for use in high performance composites are glass, carbon and aramid fibers.