Introduction

The last decade has seen a significant growth in activity concerned with the technology of composite materials. It began with an interest in the properties of the primary component—the reinforcement. Studies of whisker and glass filament technology proceeded to interest in advanced continuous filaments such as boron and carbon. As our understanding of composites matured, it became clear that the second phase—the matrix—was not just a glue to hold the fibers together but played a significant role in composite behavior. The ability to transfer load from fiber to fiber and the transverse and shear properties of the composite material are dependent primarily upon the matrix.

As our understanding has progressed, it has become apparent that a third entity—the interface between fiber and matrix—plays a profound role in the behavior of composite materials. Although a precise description of the interface is beyond our present knowledge, an understanding of the role of the interface in composite behavior and the ability to control the interface are as important as the understanding and control of the two primary components. The basic load transfer mechanism between fiber and matrix is predicated on a strong interfacial bond, chemical or mechanical. The production of a well-bonded interface is a critical factor in the composite fabrication technique. The transverse and shear properties in a composite, in many cases, are limited by the properties of the interface. The stability of the structure during elevated temperature fabrication or service is a function of reactions which occur at the interface and the relative interfacial energy. In addition, the interface plays a very important role in the fracture behavior of a composite material. By diverting cracks through a mechanism involving interfacial delamination, a composite material consisting of two brittle phases can exhibit significant toughness.

The papers contained in this book were the result of a conference held by ASTM in 1968 to examine the role of interfaces in composite

materials. It represents a broad coverage of the subject including fabrication, mechanical behavior, fracture, and elevated temperature stability and considers both whisker and continuous filament reinforced organic and metallic materials.

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