

Overview

The *D-30 Committee on High Modulus Fibers and Their Composites* of the American Society for Testing and Materials (ASTM) sponsored and organized the *Symposium on Fiber, Matrix, and Interface Properties*, held 14 November 1994 in Phoenix, AZ. This symposium focused on the subjects of fibers, matrices, and their interface/interphase in composite materials with an emphasis on fiber-matrix adhesion and its characterization.

Applications of composite materials, whether they be polymeric, metallic, or ceramic, grew dramatically over the last decade. Rapid developments in glass and carbon fibers, matrices, and processing methods occurred during the late 80s and early 90s. These new materials and processes opened up a myriad of new applications. As the industry matured the pace of improvement slowed. Throughout this time, the constituent properties were improved or modified based on testing of the finished composite mechanical performance. This method yielded new composite materials capable of providing an advantage in density, strength, and stiffness, but only with considerable effort. Now, researchers are studying the interaction between fiber and matrix and the role of the fiber-matrix interface/interphase in composite performance. With an understanding of this relationship we can extract the maximum performance and value from current materials and reduce the cost and risk of new fiber or matrix development.

The research community has been actively pursuing a clearer understanding of the structure and role of the interface/interphase in composite performance. In particular, test methods have been the subject of a great deal of attention so that interfacial properties could be measured in a meaningful way and related to composite performance. This has forced a reexamination of the assumptions under which many of the "standard" fiber-matrix adhesion test methods have been developed. This symposium brought together leading researchers in the field to present and discuss the latest developments for the benefit of the composites community.

This symposium contains research papers presented by various authors who have directed their attention towards this new class of interfacial problems. This volume contains results from the application of the most commonly used test methods (fragmentation, pull-out, indentation) to high-performance composites and their constituents, as well as their analysis. It also contains several applications papers in which fiber-matrix adhesion was evaluated as part of the overall assessment of composite performance. Two notable additions to the field are the development and use of voltage contrast XPS for assessing adhesion of fiber to matrix in real composite materials and the use of dynamic mechanical methods to evaluate interfacial properties in high-volume fraction composites.

This symposium volume will be a significant addition to the personal or corporate library of scientists and engineers concerned with either the fundamentals of fiber-matrix adhesion or practitioners concerned with the evaluation of surface treatments and methods for optimizing adhesion in composite materials.

The papers are timely and contain substantial reviews of the current literature so that they can serve as a benchmark for future work. Some authors have identified future directions and promising approaches to advancing the understanding of the interface/interphase.