

Introduction

This volume represents a collection of papers obtained from presentations made at the Seventh Conference on Composite Materials: Testing and Design held in Philadelphia, PA, 2–4 April, 1984. All seven of the conferences held under this title have been sponsored by ASTM Committee D-30 on High Modulus Fibers and Their Composites (New Orleans, 1969, *ASTM STP 460*; Anaheim, 1971, *ASTM STP 497*; Williamsburg, 1973, *ASTM STP 546*; Valley Forge, 1976, *ASTM STP 617*; New Orleans, 1978, *ASTM STP 674*; Phoenix, 1981, *ASTM STP 787*).

Although this conference has traditionally covered all aspects of composite materials technology, it is interesting to note the emphasis of the papers associated with each of the previous six conferences, as it provides an important historical background to research in the area. In the first two conferences, for example, considerable emphasis was placed on test methods. This was very timely, as in the early days of advanced composites technology there was a tendency to apply metallic materials test methods to fiber-reinforced composites. The heterogeneous, anisotropic nature of composite materials required that many of the test methods borrowed from metallic technology be carefully scrutinized for application to advanced composites.

In the third conference, emphasis began to shift away from the more routine tests and began to focus on such areas as fatigue and creep. The concern over the effects of high humidity on the elevated-temperature properties of epoxy resin matrix composites was also introduced into this conference. This was a prelude to the era of “the moisture problem.” Fracture, impact response, and environmental effects were emphasized in the fourth conference. The fifth conference represented a wide spectrum of activity in composite materials. Although a session on environmental effects was presented, the concern over moisture effects was subsiding considerably. Fatigue, time-dependent behavior, and nondestructive evaluation were topics of particular interest in the sixth conference.

The seventh conference reflects the current issue of toughness as related to damage tolerance of advanced composites. Sessions on failure mechanisms, delamination, and strength strongly emphasize toughness. Structural aspects of damage tolerance are also addressed. Many of the papers reflect the maturity to which composites technology has arrived. Most of the easy problems have been

solved. Researchers are now faced with characterizing and analyzing the complex failure mechanisms associated with stress concentrations and delaminations. The conference also contains a number of papers on the emerging materials. In particular, multi-dimensionally reinforced materials in the form of woven and braided structure are discussed.

This volume contains 23 of the 31 papers presented at the conference. The five major sections correspond to the conference sessions: Structures, Failure Mechanisms, Strength, Delamination, and Analysis and Characterization.

Since topics of major interest are included in this volume, it is highly recommended to researchers and designers in the field of composite materials. This volume along with the other six volumes from the testing and design conferences provide an excellent background for the beginner who wishes to know details about the development of composite materials technology.

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