Composite Materials: Testing and Design (Tenth Volume)

Glenn C. Grimes, editor

ASTM Publication Code Number (PCN)
04-011200-33

ASTM
1916 Race Street
Philadelphia, PA 19103
Contents

Overview 1

KEYNOTE ADDRESS

Reflections on the Development of Test Methods for Advanced Composites—
JAMES M. WHITNEY

SESSION I
COMPRESSION TEST METHODOLOGY ANALYSIS AND DEVELOPMENT
PAUL A. LAGACE, CHAIRMAN

Overview 19

The Influence of Fiber Waviness on the Compressive Behavior of Unidirectional
Continuous Fiber Composites—ALTON L. HIGHSMITH, JOHN J. DAVIS, AND
KAYLEEN L. E. HELMS 20

Open Hole and Postimpact Compressive Fatigue of Stitched and Unstitched
Carbon-Epoxy Composites—MARC A. PORTANOVA, CLARENCE C. POE, AND
JOHN D. WHITCOMB 37

A Method for Evaluating the High Strain Rate Compressive Properties of
Composite Materials—DENISE M. MONTIEL AND CAROL J. WILLIAMS 54

SESSION II
GENERAL TEST METHODOLOGY ANALYSIS AND DEVELOPMENT
MICHAEL G. CASTELLI, CHAIRMAN

Overview 69

Thermomechanical Testing of High-Temperature Composites: Thermomechanical
Fatigue (TMF) Behavior of SiC(SCS-6)/Ti-15-3—MICHAEL G. CASTELLI,
PAAUL BARTOLOTTA, AND JOHN R. ELLIS 70

In-Plane Biaxial Compressive Deformation and Failure of E-Glass/Epoxy
Laminates—SHIING-HWA DOONG, JAMES E. PAORO, AND
DARRELL F. SOCIE 87
The Effect of Tab Orientation on the Distribution of Strains in Composite Specimens—Bryan C. Foos, William E. Wolfe, and Raghbir S. Sandhu 103

SESSION III
MATERIAL MECHANICAL PROPERTIES AND FAILURE CRITERIA
Stephen R. Swanson, Chairman

Overview
117

Characterization of IM7 Graphite/Thermoplastic Polyetheretherketone (PEEK) for Spacecraft Structural Applications—Edward M. Silverman, Chris R. Wiacek, and Richard A. Griege 118

Hot/Wet Testing of Celion 3000/PMR-15 Coupon Specimens—Elizabeth Blount Kinman 131

A Scientific Approach to Composite Laminate Strength Prediction—L. J. Hart-Smith 142

SESSION IV
ADVANCED MATERIALS ANALYSIS AND TEST
Robert B. Croman, Chairman

Overview
173

Characterization of Unnotched SCS-6/Ti-15-3 Metal Matrix Composites at 650°—William D. Pollock and W. Steven Johnson 175

High-Temperature Fatigue Behavior of a SiC/Ti-24Al-11Nb Composite—Paul A. Bartolotta and Pamela K. Brindley 192


A Macro-Micromechanics Analysis of a Notched Metal Matrix Composite—Catherine A. Bigelow and Rajiv A. Naik 222

SESSION V
ANALYSIS, TEST, AND CERTIFICATION OF STRUCTURE
Thomas J. Dunyak, Chairman

Overview
237


Analysis and Testing of a Composite Sandwich Shell Horizontal Tail—Mark A. Sherouse and John C. McWhorter, III 253
Composite Material Stub-Blade Wing Joint—WALTER M. FRANKLIN AND BRYAN W. KREIMENDAHL

Temperature and Load Cycling of a Thick Polyimide Quartz Laminate—RENE E. LAURENCOT AND LAURA M. KEEN

SESSION VI
QUALITY ASSURANCE AND PROCESS CONTROL
KARL V. STEINER, CHAIRMAN

Overview

Effects of Processing Variables on the Quality of Co-Cured Sandwich Panels—PIERRE JOUIN, DAVID POLLOCK, AND ED RUDISILL

An Evaluation of the Current Status of Automated Process Control for Thermosetting Composites—MICHAEL W. HOLL AND LAWRENCE W. REIFHELD

Analysis of Composite Material Containing Defects—ROBERT S. FRANKLE, DONALD R. JONES, BARON L. ROBERTS, AND LISA M. SHUSTO

Image Enhancement Techniques for Ultrasonic NDE Applications—KARL V. STEINER

SESSION VII
INTERLAMINAR FRACTURE ANALYSIS AND TEST
T. KEVIN O'BRIEN, CHAIRMAN

Overview

Free-Edge Stress Analysis of Glass-Epoxy Laminates with Matrix Cracks—JOHN C. FISH AND T. KEVIN O'BRIEN

Delamination Failure in a Unidirectional Curved Composite Laminate—RODERICK H. MARTIN

Efficient Use of Film Adhesive Interlayers to Suppress Delamination—PAUL A. LAGACE AND NARENDRA V. BHAT

SESSION VIII
DAMAGE, FLAWS, AND REPAIR
SUSAN S. AVERY, CHAIRMAN

Overview

Damage Tolerance of Three-Dimensional Commingled PEEK/Carbon Composites—CAM T. HUA, JIA-NI CHU, AND FRANK K. KO
Damage Accumulation and Fracture of Notched Composite Laminates Under Tensile and Compressive Loading—SENG C. TAN AND RAN Y. KIM 414

Advances in Thermographic Stress Analysis and Evaluation of Damage in Composites—DAQING ZHANG AND BELA I. SANDOR 428

Stress Field Sensitivity of a Composite Patch Repair as a Result of Varying Patch Thickness—MICHAEL P. SIENER 444

Index 465