

THIRD EDITION

FIBER- REINFORCED COMPOSITES

*Materials, Manufacturing,
and Design*

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Materials, Manufacturing,
and Design

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To
my parents

Contents

Preface to the Third Edition

Author

Chapter 1 Introduction

- 1.1 Definition
- 1.2 General Characteristics
- 1.3 Applications
 - 1.3.1 Aircraft and Military Applications
 - 1.3.2 Space Applications
 - 1.3.3 Automotive Applications
 - 1.3.4 Sporting Goods Applications
 - 1.3.5 Marine Applications
 - 1.3.6 Infrastructure
- 1.4 Material Selection Process
- References
- Problems

Chapter 2 Materials

- 2.1 Fibers
 - 2.1.1 Glass Fibers
 - 2.1.2 Carbon Fibers
 - 2.1.3 Aramid Fibers
 - 2.1.4 Extended Chain Polyethylene Fibers
 - 2.1.5 Natural Fibers
 - 2.1.6 Boron Fibers
 - 2.1.7 Ceramic Fibers
- 2.2 Matrix
 - 2.2.1 Polymer Matrix
 - 2.2.1.1 Thermoplastic and Thermoset Polymers
 - 2.2.1.2 Unique Characteristics of Polymeric Solids
 - 2.2.1.3 Creep and Stress Relaxation
 - 2.2.1.4 Heat Deflection Temperature
 - 2.2.1.5 Selection of Matrix: Thermosets vs. Thermoplastics

- 2.2.2 Metal Matrix
- 2.2.3 Ceramic Matrix
- 2.3 Thermoset Matrix
 - 2.3.1 Epoxy
 - 2.3.2 Polyester
 - 2.3.3 Vinyl Ester
 - 2.3.4 Bismaleimides and Other Thermoset Polyimides
 - 2.3.5 Cyanate Ester
- 2.4 Thermoplastic Matrix
 - 2.4.1 Polyether Ether Ketone
 - 2.4.2 Polyphenylene Sulfide
 - 2.4.3 Polysulfone
 - 2.4.4 Thermoplastic Polyimides
- 2.5 Fiber Surface Treatments
 - 2.5.1 Glass Fibers
 - 2.5.2 Carbon Fibers
 - 2.5.3 Kevlar Fibers
- 2.6 Fillers and Other Additives
- 2.7 Incorporation of Fibers into Matrix
 - 2.7.1 Prepregs
 - 2.7.2 Sheet-Molding Compounds
 - 2.7.3 Incorporation of Fibers into Thermoplastic Resins
- 2.8 Fiber Content, Density, and Void Content
- 2.9 Fiber Architecture
- References
- Problems

Chapter 3 Mechanics

- 3.1 Fiber–Matrix Interactions in a Unidirectional Lamina
 - 3.1.1 Longitudinal Tensile Loading
 - 3.1.1.1 Unidirectional Continuous Fibers
 - 3.1.1.2 Unidirectional Discontinuous Fibers
 - 3.1.1.3 Microfailure Modes in Longitudinal Tension
 - 3.1.2 Transverse Tensile Loading
 - 3.1.3 Longitudinal Compressive Loading
 - 3.1.4 Transverse Compressive Loading
- 3.2 Characteristics of a Fiber-Reinforced Lamina
 - 3.2.1 Fundamentals
 - 3.2.1.1 Coordinate Axes
 - 3.2.1.2 Notations
 - 3.2.1.3 Stress and Strain Transformations in a Thin Lamina under Plane Stress
 - 3.2.1.4 Isotropic, Anisotropic, and Orthotropic Materials

- 3.2.2 Elastic Properties of a Lamina
 - 3.2.2.1 Unidirectional Continuous Fiber 0° Lamina
 - 3.2.2.2 Unidirectional Continuous Fiber Angle-Ply Lamina
 - 3.2.2.3 Unidirectional Discontinuous Fiber 0° Lamina
 - 3.2.2.4 Randomly Oriented Discontinuous Fiber Lamina
- 3.2.3 Coefficients of Linear Thermal Expansion
- 3.2.4 Stress–Strain Relationships for a Thin Lamina
 - 3.2.4.1 Isotropic Lamina
 - 3.2.4.2 Orthotropic Lamina
- 3.2.5 Compliance and Stiffness Matrices
 - 3.2.5.1 Isotropic Lamina
 - 3.2.5.2 Specially Orthotropic Lamina ($\theta = 0^\circ$ or 90°)
 - 3.2.5.3 General Orthotropic Lamina ($\theta \neq 0^\circ$ or 90°)
- 3.3 Laminated Structure
 - 3.3.1 From Lamina to Laminate
 - 3.3.2 Lamination Theory
 - 3.3.2.1 Assumptions
 - 3.3.2.2 Laminate Strains
 - 3.3.2.3 Laminate Forces and Moments
 - 3.3.2.4 Elements in Stiffness Matrices
 - 3.3.2.5 Midplane Strains and Curvatures
 - 3.3.2.6 Lamina Strains and Stresses Due to Applied Loads
 - 3.3.2.7 Thermal Strains and Stresses
- 3.4 Interlaminar Stresses
- References
- Problems

Chapter 4 Performance

- 4.1 Static Mechanical Properties
 - 4.1.1 Tensile Properties
 - 4.1.1.1 Test Method and Analysis
 - 4.1.1.2 Unidirectional Laminates
 - 4.1.1.3 Cross-Ply Laminates
 - 4.1.1.4 Multidirectional Laminates
 - 4.1.1.5 Woven Fabric Laminates
 - 4.1.1.6 Sheet-Molding Compounds
 - 4.1.1.7 Interply Hybrid Laminates
 - 4.1.2 Compressive Properties
 - 4.1.3 Flexural Properties
 - 4.1.4 In-Plane Shear Properties
 - 4.1.5 Interlaminar Shear Strength

- 4.2 Fatigue Properties
 - 4.2.1 Fatigue Test Methods
 - 4.2.2 Fatigue Performance
 - 4.2.2.1 Tension–Tension Fatigue
 - 4.2.2.2 Flexural Fatigue
 - 4.2.2.3 Interlaminar Shear Fatigue
 - 4.2.2.4 Torsional Fatigue
 - 4.2.2.5 Compressive Fatigue
 - 4.2.3 Variables in Fatigue Performance
 - 4.2.3.1 Effect of Material Variables
 - 4.2.3.2 Effect of Mean Stress
 - 4.2.3.3 Effect of Frequency
 - 4.2.3.4 Effect of Notches
 - 4.2.4 Fatigue Damage Mechanisms in Tension–Tension Fatigue Tests
 - 4.2.4.1 Continuous Fiber 0° Laminates
 - 4.2.4.2 Cross-Ply and Other Multidirectional Continuous Fiber Laminates
 - 4.2.4.3 SMC-R Laminates
 - 4.2.5 Fatigue Damage and Its Consequences
 - 4.2.6 Postfatigue Residual Strength
- 4.3 Impact Properties
 - 4.3.1 Charpy, Izod, and Drop-Weight Impact Test
 - 4.3.2 Fracture Initiation and Propagation Energies
 - 4.3.3 Material Parameters
 - 4.3.4 Low-Energy Impact Tests
 - 4.3.5 Residual Strength After Impact
 - 4.3.6 Compression-After-Impact Test
- 4.4 Other Properties
 - 4.4.1 Pin-Bearing Strength
 - 4.4.2 Damping Properties
 - 4.4.3 Coefficient of Thermal Expansion
 - 4.4.4 Thermal Conductivity
- 4.5 Environmental Effects
 - 4.5.1 Elevated Temperature
 - 4.5.2 Moisture
 - 4.5.2.1 Moisture Concentration
 - 4.5.2.2 Physical Effects of Moisture Absorption
 - 4.5.2.3 Changes in Performance Due to Moisture and Temperature
- 4.6 Long-Term Properties
 - 4.6.1 Creep
 - 4.6.1.1 Creep Data

- 4.6.1.2 Long-Term Creep Behavior
- 4.6.1.3 Schapery Creep and Recovery Equations
- 4.6.2 Stress Rupture
- 4.7 Fracture Behavior and Damage Tolerance
 - 4.7.1 Crack Growth Resistance
 - 4.7.2 Delamination Growth Resistance
 - 4.7.2.1 Mode I Delamination
 - 4.7.2.2 Mode II Delamination
 - 4.7.3 Methods of Improving Damage Tolerance
 - 4.7.3.1 Matrix Toughness
 - 4.7.3.2 Interleaving
 - 4.7.3.3 Stacking Sequence
 - 4.7.3.4 Interply Hybridization
 - 4.7.3.5 Through-the-Thickness Reinforcement
 - 4.7.3.6 Ply Termination
 - 4.7.3.7 Edge Modification

References

Problems

Chapter 5 Manufacturing

- 5.1 Fundamentals
 - 5.1.1 Degree of Cure
 - 5.1.2 Viscosity
 - 5.1.3 Resin Flow
 - 5.1.4 Consolidation
 - 5.1.5 Gel-Time Test
 - 5.1.6 Shrinkage
 - 5.1.7 Voids
- 5.2 Bag-Molding Process
- 5.3 Compression Molding
- 5.4 Pultrusion
- 5.5 Filament Winding
- 5.6 Liquid Composite Molding Processes
 - 5.6.1 Resin Transfer Molding
 - 5.6.2 Structural Reaction Injection Molding
- 5.7 Other Manufacturing Processes
 - 5.7.1 Resin Film Infusion
 - 5.7.2 Elastic Reservoir Molding
 - 5.7.3 Tube Rolling
- 5.8 Manufacturing Processes for Thermoplastic Matrix Composites
- 5.9 Quality Inspection Methods
 - 5.9.1 Raw Materials
 - 5.9.2 Cure Cycle Monitoring

- 5.9.3 Cured Composite Part
 - 5.9.3.1 Radiography
 - 5.9.3.2 Ultrasonic
 - 5.9.3.3 Acoustic Emission
 - 5.9.3.4 Acousto-Ultrasonic
 - 5.9.3.5 Thermography
- 5.10 Cost Issues
- References
- Problems

Chapter 6 Design

- 6.1 Failure Prediction
 - 6.1.1 Failure Prediction in a Unidirectional Lamina
 - 6.1.1.1 Maximum Stress Theory
 - 6.1.1.2 Maximum Strain Theory
 - 6.1.1.3 Azzi–Tsai–Hill Theory
 - 6.1.1.4 Tsai–Wu Failure Theory
 - 6.1.2 Failure Prediction for Unnotched Laminates
 - 6.1.2.1 Consequence of Lamina Failure
 - 6.1.2.2 Ultimate Failure of a Laminate
 - 6.1.3 Failure Prediction in Random Fiber Laminates
 - 6.1.4 Failure Prediction in Notched Laminates
 - 6.1.4.1 Stress Concentration Factor
 - 6.1.4.2 Hole Size Effect on Strength
 - 6.1.5 Failure Prediction for Delamination Initiation
- 6.2 Laminate Design Considerations
 - 6.2.1 Design Philosophy
 - 6.2.2 Design Criteria
 - 6.2.3 Design Allowables
 - 6.2.4 General Design Guidelines
 - 6.2.4.1 Laminate Design for Strength
 - 6.2.4.2 Laminate Design for Stiffness
 - 6.2.5 Finite Element Analysis
- 6.3 Joint Design
 - 6.3.1 Mechanical Joints
 - 6.3.2 Bonded Joints
- 6.4 Design Examples
 - 6.4.1 Design of a Tension Member
 - 6.4.2 Design of a Compression Member
 - 6.4.3 Design of a Beam
 - 6.4.4 Design of a Torsional Member
- 6.5 Application Examples

- 6.5.1 Inboard Ailerons on Lockheed L-1011 Aircraft
- 6.5.2 Composite Pressure Vessels
- 6.5.3 Corvette Leaf Springs
- 6.5.4 Tubes for Space Station Truss Structure

References

Problems

Chapter 7 Metal, Ceramic, and Carbon Matrix Composites

7.1 Metal Matrix Composites

7.1.1 Mechanical Properties

7.1.1.1 Continuous-Fiber MMC

7.1.1.2 Discontinuously Reinforced MMC

7.1.2 Manufacturing Processes

7.1.2.1 Continuously Reinforced MMC

7.1.2.2 Discontinuously Reinforced MMC

7.2 Ceramic Matrix Composites

7.2.1 Micromechanics

7.2.2 Mechanical Properties

7.2.2.1 Glass Matrix Composites

7.2.2.2 Polycrystalline Ceramic Matrix

7.2.3 Manufacturing Processes

7.2.3.1 Powder Consolidation Process

7.2.3.2 Chemical Processes

7.3 Carbon Matrix Composites

References

Problems

Chapter 8 Polymer Nanocomposites

8.1 Nanoclay

8.2 Carbon Nanofibers

8.3 Carbon Nanotubes

8.3.1 Structure

8.3.2 Production of Carbon Nanotubes

8.3.3 Functionalization of Carbon Nanotubes

8.3.4 Mechanical Properties of Carbon Nanotubes

8.3.5 Carbon Nanotube–Polymer Composites

8.3.6 Properties of Carbon Nanotube–Polymer Composites

References

Problems

Appendixes

A.1 Woven Fabric Terminology

A.2 Residual Stresses in Fibers and Matrix in a Lamina
Due to Cooling

Reference

A.3 Alternative Equations for the Elastic and Thermal
Properties of a Lamina

References

A.4 Halpin–Tsai Equations

References

A.5 Typical Mechanical Properties of Unidirectional
Continuous Fiber Composites

A.6 Properties of Various SMC Composites

A.7 Finite Width Correction Factor for Isotropic Plates

A.8 Determination of Design Allowables

A.8.1 Normal Distribution

A.8.2 Weibull Distribution

Reference

A.9 Typical Mechanical Properties of Metal Matrix Composites

A.10 Useful References

A.10.1 Text and Reference Books

A.10.2 Leading Journals on Composite Materials

A.10.3 Professional Societies Associated with Conferences
and Publications on Composite Materials

A.11 List of Selected Computer Programs

Preface to the Third Edition

Almost a decade has gone by since the second edition of this book was published. The fundamental understanding of fiber reinforcement has not changed, but many new advancements have taken place in the materials area, especially after the discovery of carbon nanotubes in 1991. There has also been increasing applications of composite materials, which started mainly in the aerospace industry in the 1950s, but now can be seen in many nonaerospace industries, including consumer goods, automotive, power transmission, and biomedical. It is now becoming a part of the “regular” materials vocabulary.

The third edition is written to update the book with recent advancements and applications.

Almost all the chapters in the book have been extended with new information, example problems and chapter-end problems. Chapter 1 has been rewritten to show the increasing range of applications of fiber-reinforced polymers and emphasize the material selection process. Chapter 2 has two new sections, one on natural fibers and the other on fiber architecture. Chapter 7 has a new section on carbon–carbon composites. Chapter 8 has been added to introduce polymer-based nanocomposites, which are the most recent addition to the composite family and are receiving great attention from both researchers as well as potential users.

As before, I have tried to maintain a balance between materials, mechanics, processing and design of fiber-reinforced composites. This book is best-suited for senior-level undergraduate or first-level graduate students, who I believe will be able to acquire a broad knowledge on composite materials from this book. Numerous example problems and chapter-end problems will help them better understand and apply the concepts to practical solutions. Numerous references cited in the book will help them find additional research information and go deeper into topics that are of interest to them.

I would like to thank the students, faculty and others who have used the earlier editions of this book in the past. I have received suggestions and encouragement from several faculty on writing the third edition—thanks to them. Finally, the editorial and production staff of the CRC Press needs to be acknowledged for their work and patience—thanks to them also.

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P.K. Mallick is a professor in the Department of Mechanical Engineering and the director of Interdisciplinary Programs at the University of Michigan-Dearborn. He is also the director of the Center for Lightweighting Automotive Materials and Processing at the University. His areas of research interest are mechanical properties, design considerations, and manufacturing process development of polymers, polymer matrix composites, and lightweight alloys. He has published more than 100 technical articles on these topics, and also authored or coauthored several books on composite materials, including *Composite Materials Handbook and Composite Materials Technology*. He is a fellow of the American Society of Mechanical Engineers. Dr Mallick received his BE degree (1966) in mechanical engineering from Calcutta University, India, and the MS (1970) and PhD (1973) degrees in mechanical engineering from the Illinois Institute of Technology.

