

Contents

| | |
|--------------|-----|
| CONTRIBUTORS | vii |
| PREFACE | ix |

Nanomechanics of Defects in Solids

Michael Ortiz and Rob Phillips

| | |
|--|----|
| I. Introduction | 2 |
| II. Atomistic Models of Material Behavior | 5 |
| III. Patched Atomistic/Continuum Models | 11 |
| IV. Lattice Statics | 29 |
| V. Cauchy–Born Theory of Crystal Elasticity | 51 |
| VI. Quasicontinuum Theory | 55 |
| VII. Applications of the Quasicontinuum Method | 61 |
| VIII. Concluding Remarks | 72 |
| Acknowledgments | 73 |
| References | 73 |

Modeling Microstructure Evolution in Engineering Materials

Alan C. F. Cocks, Simon P. A. Gill, and Jingzhe Pan

| | |
|---|-----|
| I. Introduction | 82 |
| II. Microscopic Constitutive Laws | 84 |
| III. Thermodynamic Variational Principle | 90 |
| IV. Numerical Models | 95 |
| V. Rayleigh–Ritz Analyses | 150 |
| VI. Structure of Constitutive Laws for the Deformation of Engineering Materials | 154 |
| VII. Concluding Remarks | 159 |
| References | 160 |

Stochastic Damage Evolution and Failure in Fiber-Reinforced Composites

W. A. Curtin

| | |
|--|-----|
| I. Introduction | 164 |
| II. Preliminary Issues | 168 |
| III. Single-Fiber Composite | 173 |
| IV. Multifiber Composites: Global Load Sharing | 185 |

| | |
|--|-----|
| V. Multifiber Composites: Local Load Sharing | 212 |
| VI. Future Directions | 244 |
| Acknowledgments | 247 |
| References | 248 |
| AUTHOR INDEX | 255 |
| SUBJECT INDEX | 261 |