

Contents

LIST OF CONTRIBUTORS	ix
FOREWORD	xi
PREFACE	xiii
CONTENTS OF PREVIOUS VOLUMES	xv

Low Temperature of Deformation of bcc Metals and Their Solid-Solution Alloys

R. J. Arsenault

I. Introduction	1
II. Asymmetry of Slip and Yielding	2
III. Dislocation Configurations	9
IV. Core Structure of a Screw Dislocation	26
V. Thermal Activation Analysis of Dislocation Dynamics	27
VI. Interstitial Alloys	62
VII. Hydrogen Alloys	69
VIII. Substitutional Alloys	71
IX. Radiation Effects	83
X. The Superconducting State	90
XI. Conclusions	94
References	95

Cyclic Deformation of Metals and Alloys

Campbell Laird

I. Introduction	101
II. Cyclic Stress–Strain Response of Single Phase Metals and Alloys	108
III. Cyclic Stress–Strain Response of Multiphase Materials	144

IV. The Value of Microstructural Studies in Predicting Cyclic Stress–Strain Response	154
V. Summary	158
References	159

High-Temperature Creep

Amiya K. Mukherjee

I. Introduction	164
II. Typical Creep Curves	165
III. Mechanical Behavior	167
IV. Comparison with Experimental Results	173
V. Microstructural Aspects in Creep	183
VI. Creep in Very Fine-Grained Structure	191
VII. Correlations of Creep Mechanisms	197
VIII. A Universal Law for Transient Creep	206
IX. Reflections on Some Specific Aspects of Creep	212
X. Summary	218
References	221

Review Topics in Superplasticity

Thomas H. Alden

I. Introduction	226
II. Production of Fine Grain Size	232
III. Microstructural Changes during Deformation	237
IV. Rate-Sensitive Deformation—Material Effect	242
V. Rate-Sensitive Deformation—Temperature Effect	246
VI. Creep	249
VII. Discussion	254
VIII. Summary	264
References	264

Fatigue Deformation of Polymers

P. Beardmore and S. Rabinowitz

I. Introduction	267
II. General Fatigue Considerations	270
III. Phenomenological Cyclic Deformation Behavior	274

CONTENTS	<i>vii</i>
IV. Fatigue Behavior	307
V. Mechanisms of Fatigue	310
VI. Summary	330
References	330

Low Temperature Deformation of Crystalline Nonmetals

R. G. Wolfson

I. Introduction	333
II. Semibrittle Behavior	336
III. Ionic Crystals	349
IV. Covalent Crystals	366
V. Suppression of Brittle Fracture	375
References	386

Recovery and Recrystallization during High Temperature Deformation

H. J. McQueen and J. J. Jonas

I. Introduction	394
II. Static Recovery and Recrystallization after Cold Working	397
III. Dynamic Recovery at Elevated Temperatures	401
IV. Dynamic Recrystallization	438
V. Static Recovery and Recrystallization after Hot Working	461
VI. The Effect of High Temperature Deformation on the Room Temperature Mechanical Properties	478
VII. Summary	486
References	490

SUBJECT INDEX	495
---------------	-----