

CONTENTS

CONTRIBUTORS	ix
PREFACE	xi

1

The Anomalous Elastic Properties of Materials Undergoing Cooperative Jahn–Teller Phase Transitions

R. L. MELCHER

I. INTRODUCTION	1
II. THE JAHN–TELLER EFFECT	3
III. THEORY OF ELASTIC PROPERTIES OF COOPERATIVE JAHN–TELLER SYSTEMS	9
IV. APPLICATION TO RARE EARTH CRYSTALS	25
V. TRANSITION METAL ION COMPOUNDS	67
VI. SUMMARY	73
REFERENCES	75

2

Superconducting Tunneling Junctions as Phonon Generators and Detectors

W. EISENMENGER

I. INTRODUCTION	80
II. BASIC ASPECTS OF PHONON GENERATION AND DETECTION BY SINGLE-PARTICLE TUNNELING IN SUPERCONDUCTORS	82
III. BASIC EXPERIMENTS	87
IV. QUANTITATIVE PHONON DETECTION MODEL	98
V. PHONON EMISSION SPECTRA	113
VI. APPLICATIONS	137

VII. FURTHER APPLICATIONS AND FINAL REMARKS	149
REFERENCES	151

3

Ultrasonic Properties of Glasses at Low Temperatures

S. HUNKLINGER AND W. ARNOLD

I. INTRODUCTION	155
II. MICROSCOPIC STRUCTURE OF GLASSES	156
III. ULTRASONIC PROPERTIES OF GLASSES ABOVE HELIUM TEMPERATURE	160
IV. ANOMALOUS ACOUSTIC AND THERMAL BEHAVIOR OF GLASSES BELOW HELIUM TEMPERATURE	170
V. PHENOMENOLOGICAL EXPLANATION OF THE LOW- TEMPERATURE BEHAVIOR	177
VI. MICROSCOPIC MODEL	203
VII. CONCLUSION	210
REFERENCES	212

4

Acoustical Response of Submerged Elastic Structures Obtained through Integral Transforms

H. ÜBERALL AND H. HUANG

I. INTRODUCTION	217
II. NORMAL-MODE SOLUTION OF THE PULSE PROBLEM	232
III. EXPERIMENTS AND NUMERICAL MODE CALCULATIONS	244
IV. WATSON-SOMMERFELD TRANSFORM	254
V. GEOPHYSICAL AND MATERIALS-TESTING PROBLEMS	270
REFERENCES	272
NOTE ADDED IN PROOF	275

5

Ultrasonic Velocity and Attenuation: Measurement Methods with Scientific and Industrial Applications

EMMANUEL P. PAPADAKIS

I. INTRODUCTION	277
II. VELOCITY	279

Contents

vii

III. ABSOLUTE ACCURACY OF THE PULSE-ECHO-OVERLAP METHOD AND THE PULSE SUPERPOSITION METHOD FOR ULTRASONIC VELOCITY	319
IV. ATTENUATION	323
V. INDUSTRIAL APPLICATIONS	335
VI. SUMMARY	371
REFERENCES	371
BIBLIOGRAPHY	374
AUTHOR INDEX	375
SUBJECT INDEX	383
CONTENTS OF PREVIOUS VOLUMES	390