

## Contents

PREFACE	xi
ACKNOWLEDGMENT	xiii
LIST OF PARTICIPANTS	xv
ADVANCES IN SYNTHESIZED SUPERLATTICES Leo Esaki	1
Introduction	1
Theoretical Treatments	3
Optical Absorption	6
Semiconductor-Semimetal Transitions and Shubnikov-de Haas Oscillations	8
Far Infrared Magneto-Absorption and Cyclotron Resonance	15
Polytype Superlattices and Multi-Heterojunctions	16
Conclusion	18
Acknowledgments	18
References	18
ARTIFICIAL METALLIC SUPERLATTICES Charles M. Falco and Ivan K. Schuller	21
Introduction	21
Sample Preparation	21
Structure	24
Physical Properties	30
Summary	31
Acknowledgments	33
References	34
PROPERTY MODIFICATION BY EPITAXIAL METAL FILM SANDWICHES (EMFS) Merwyn B. Brodsky	35
Introduction	35
Experimental Methods	37
Results and Discussion	38
Au/Pd/Au	38
Ag/Pd/Ag	39
Au/Cr/Au	43
Fe/Cu-Au	46
Pd/Nb	47
Summary	47
Acknowledgment	47
References	48
METALLIC GLASSES—REMEMBRANCES AND PROSPECTS Pol Duwez	51

SYNTHESIS OF NON-EQUILIBRIUM STRUCTURES IN UNDERCOOLED LIQUID DROPLETS J. H. Perepezko and J. S. Paik	57
Introduction	57
Experimental Undercooling Techniques	58
Undercooling Characteristics of Liquid Droplets	60
Properties of Undercooled Liquids	64
Influence of Undercooling on Solid Phase Selection	66
Alloys	72
Summary	73
Acknowledgment	86
References	86
 SPIN POLARIZED ATOMIC HYDROGEN - A REVIEW Lewis H. Nosanow	 89
Introduction	89
What is Spin Polarized Atomic Hydrogen?	90
Phenomenological Interactions, Quantum Parameter, and Statistics	95
Hyperfine States and Rate Processes	96
Three Dimensional H <sup>+</sup> and D <sup>+</sup>	102
Two Dimensional H <sup>+</sup> and D <sup>+</sup>	102
Concluding Remarks	103
References	104
 SPIN POLARIZED ATOMIC HYDROGEN AND DEUTERIUM - NEW QUANTUM GASES Isaac F. Silvera	 107
Introduction	107
Conditions for Stabilization of H <sup>+</sup>	109
Experimental Stabilization of H <sup>+</sup>	111
Limitations on Density	114
Prospects for BEC	115
Acknowledgments	117
References	117
 TERNARY PHASES, A METALLURGICAL APPROACH TO HIGH T <sub>c</sub> SUPERCONDUCTIVITY R. N. SHELTON	 119
Introduction	119
References	127
 COEXISTENCE OF MAGNETISM AND SUPERCONDUCTIVITY IN SINGLE CRYSTAL ErRh <sub>4</sub> B <sub>4</sub> S. K. Sinha, G. W. Crabtree, D. G. Hinks and H. A. Mook	 133
Introduction	133
Experiments on Polycrystalline Samples	137
Experiments on Single Crystal Samples	138
Discussion and Conclusions	145
Acknowledgments	148
References	148

<b>ATOMIC, MOLECULAR AND CONDENSED-MATTER STUDIES USING ULTRAVIOLET EXCIMER LASERS</b>	<b>151</b>
C. K. Rhodes	
Introduction	151
Rare Gas Halogen Source Properties	155
Use of RGH Systems in Atomic and Molecular Studies	156
Future Scientific Applications	168
Summary	172
Acknowledgments	172
References	173
<b>FREE ELECTRON LASER-ITS USE IN CONDENSED MATTER PHYSICS RESEARCH</b>	<b>179</b>
C. K. N. Patel and E. D. Shaw	
Introduction	179
Free Electron Laser-Concept and Principles	180
Sources of Relativistic Electrons	184
Scientific Applications of Free Electron Lasers	185
Conclusion	191
References	191
<b>NONLINEAR OPTICAL TECHNIQUES FOR SURFACE STUDIES</b>	<b>193</b>
Y. R. Shen	
Introduction	193
Surface Nonlinear Optics	194
Surface Coherent Antistokes Raman Scattering	195
Surface Raman Gain Spectroscopy	198
Surface Second Harmonic and Sum Frequency Generation	198
Surface Enhanced Non Linear Optical Effects	200
Detection of Adsorbed Molecules by Second Harmonic Generation on a Silver Electrode	201
Discussion	205
Acknowledgments	206
References	207
<b>INELASTIC LIGHT SCATTERING IN DILUTED MAGNETIC SEMICONDUCTORS</b>	<b>209</b>
A. K. Ramdas and S. Rodriguez	
Diluted Magnetic Semiconductors	209
Inelastic Light Scattering: General Comments	211
Phonons in $\text{Cd}_{1-x}\text{Mn}_x\text{Te}$	211
Mixed Crystal Phonons	212
Magnetic Excitations	218
Acknowledgments	225
References	225

SPECTROSCOPIC STUDIES OF ELECTRON-HOLE LIQUIDS IN STRESSED Ge AND Si George K. Wong	227
Introduction	227
Theoretical Background	228
Spectroscopic Studies of EHL	230
Ground State Properties and Phase Diagram	233
EHL Lifetime and the Enhancement Factor	236
Two Component Electron-Hole Liquid	241
Conclusion	249
Acknowledgments	249
References	250
NOVEL STRUCTURAL PROPERTIES OF GRAPHITE INTERCALATION COMPOUNDS S. A. Solin	253
Introduction	253
Defining and Characterizing GIC's	253
Classification Schemes	254
Structural Phase Transitions in Donor GIC's	258
Temperature Induced Transitions	258
Pressure Induced Transitions	273
Acknowledgments	275
References	276
SHEAR MECHANICAL PROPERTIES OF FREE STANDING LIQUID CRYSTAL FILMS K. Miyano and John C. Tarczon	281
Introduction	281
Liquid Crystals	281
Freely Suspended Film	283
Experimental Setup	284
Results Above $T_{AB}$	285
Results Below $T_{AB}$	287
Conclusions	288
References	288
THE HIGH VOLTAGE ELECTRON MICROSCOPE TANDEM FACILITY AT ARGONNE NATIONAL LABORATORY A. Taylor	291
Introduction	291
Layout of Major Facility Components	291
High Voltage Electron Microscope	294
Accelerators	295
Ion Beam Interface System	297
Facility Administration and Use Policy	300
Research Operation and Results	300
References	307

PULSED NEUTRON TECHNIQUES FOR CONDENSED MATTER RESEARCH	311
B. S. Brown, J. M. Carpenter, J. D. Jorgensen, D. L. Price and W. Kamitakahara	
Pulsed Neutron Sources	311
Diffraction at Pulsed Neutron Sources	317
Inelastic Scattering at Pulsed Neutron Sources	328
Radiation Damage Studies at Pulsed Neutron Sources	333
Conclusions	337
Acknowledgments	337
References	337
SUBJECT INDEX	341