VOLUME I
CONTENTS

ATOMIC MOTION IN MODERATORS
James A. Young 3
Introduction 3
The Neutron-Phonon Interaction 4
Beryllium 7
Graphite 14
Lattice Dynamics of Beryllium Oxide 18
References 24

NEUTRON SCATTERING BY HYDROGENOUS MODERATORS
Juan U. Koppel 27
Introduction 27
Water 30
Polyethylene 48
Zirconium Hydride 58
Liquid Hydrogen 59
References 71

INCOHERENT SCATTERING OF SLOW NEUTRONS BY A LIQUID: A HINDERED-TRANSLATOR MODEL
V. Ardente, G. F. Nardelli, and L. Reatto 73
Introduction 73
The Model 75
Comparison With Experiment 79
Concluding Remarks 85
References 89

INTERPRETATION OF SCATTERING-LAW DATA
R. M. Brugger 91
Introduction 91
Gases 98
Solids 104
Liquids 111
Conclusions 120
References 120

THE VELOCITY AUTOCORRELATION FUNCTION IN LIQUIDS FROM A NEW POINT OF VIEW
Aneesur Rahman 123
Introduction 123
$\langle \underset{\sim}{r}^2(t) \rangle$ and $\langle \underset{\sim}{v}(o) \cdot \underset{\sim}{v}(t) \rangle$ 124
Dead (τ), The Direction of Eventual Atomic Displacement in Time τ 126

$S_T(t)$ and $R_T(t)$ 127
$S_T^+(t)$ and $S_T^-(t)$ 130
Discussion 131
References 133

THE INTERPRETATION OF PULSED-NEUTRON EXPERIMENTS
Noel Corngold 135
Introduction 135
The Eigenvalue Problem 136
The Calculation of Discrete Eigenvalues 143
Theory and Experiment 146
References 148

RECENT DEVELOPMENTS IN INTEGRAL NEUTRON THERMALIZATION
J. R. Beyster, J. M. Neill, and J. C. Young 151
Introduction 151
Status of Spectral Measurements 152
Status of Single Differential Scattering Investigations 172
Status of Total Cross Section Measurements 182
Conclusions 190
References 191

THERMALIZATION PROGRAM AT RENSSELAER POLYTECHNIC INSTITUTE
P. B. Daitch 195
Introduction 195
Low-Energy-Neutron Inelastic Scattering 196
Reactor Parameter and Spectra Measurements 198
Thermalization Theory 203
References 206

TRANSPORT METHODS FOR THE CALCULATION OF SPATIALLY DEPENDENT THERMAL SPECTRA
G. C. Pomraning 207
Introduction 207
Gross Leakage Effects 210
Collision-Probability Method 215
Detailed Space-Energy Calculational Methods 218
Anisotropic Scattering 224
Multigroup Constants 234
Cylindrical Cell Approximation 243
Comparison of Theory and Experiment 244
Bibliography 247

VARIATIONAL METHODS IN THE CALCULATION OF SPATIALLY DEPENDENT THERMAL SPECTRA
N. C. Francis 259
Introduction 259
General Method 260
Spectrum Averaging 263
Space-Energy Theory 266
Discussion 274
References 276

MONTE CARLO METHODS FOR THE CALCULATION OF THERMAL-NEUTRON FLUXES
E. M. Gelbard 279
References 291

AN ENERGY-DEPENDENT CALCULATION OF THE DISADVANTAGE FACTOR
Alan H. Robinson and Joel H. Ferziger 293
Introduction 293
Formulation of the Problem 293
The Eigenfunction Expansions 294
The Disadvantage Factor 297
Reduction of the Singular Integral Equations 298
Numerical Results for the Heavy-Gas Model 303
References 308

A SIMPLE MODEL FOR THE CALCULATION OF NEUTRON SPECTRA IN THERMAL REACTORS
M. Cadilhac, M. Livolant, J. L. Soulé, and O. Tretiakoff 311
Space-Independent Problems: The Secondary Model 312
The Secondary Model: Choice of the Functions j(y) and K(y) 315
Space-Dependent Problems 319
Conclusions 328
References 330

APPROXIMATE TREATMENT OF NEUTRON THERMALIZATION IN HETEROGENEOUS SYSTEMS
P. R. Haubert and N. R. Meyvaert 331
Introduction 331
Thermalization Treatment 333
Heterogeneity 335
Conclusions 346
References 347

APPLICATION OF A PHENOMENOLOGICAL THERMALIZATION MODEL TO IRRADIATED HEAVY-WATER LATTICES
A. Kind and G. Rossi 349
Introduction 349
Spectrum Incident on the Fuel Element 350
Fuel Element Spectrum 352
Application of the Method 354
References 357

DETERMINATION OF THE NEUTRON SPECTRUM IN A THERMAL REACTOR BY A FLUX SYNTHESIS METHOD
H. Hembd 359
Introduction 359
The Method 360
Numerical Solution 365
References 366

MULTI-GROUP COLLISION PROBABILITY THEORY IN CLUSTER GEOMETRY. COMPARISON WITH EXPERIMENTS
A. Jonsson and H. Pekarek 367
Introduction 367
Theoretical Methods 368
Data Used in the Calculations 370
Comparison of Theory and Experiment 374
Conclusion 388
Appendix A. Description of Fuel Assemblies and Lattice Arrangements 390
References 391

OPERATING EXPERIENCE WITH UNC-THERMOPILE, AN ADVANCED MONTE CARLO PROGRAM FOR THE EVALUATION OF THERMAL ASSEMBLIES
F. R. Nakache and S. Kellman 395
Introduction 395
General Program Description 396
Specific Program Features for Improvement of Thermalization Calculations 399
Applications 406
Conclusion 415
References 416

INDEX 419