

CONTENTS

Contributors.....	vii
Preface.....	ix
Part I: Thermal Structure of Deep Earth	1
1 Melting of Fe Alloys and the Thermal Structure of the Core <i>Rebecca A. Fischer</i>	3
2 Temperature of the Lower Mantle and Core Based on Ab Initio Mineral Physics Data <i>Taku Tsuchiya, Kenji Kawai, Xianlong Wang, Hiroki Ichikawa, and Haruhiko Dekura</i>	13
3 Heat Transfer in the Core and Mantle <i>Abby Kavner and Emma S. C. Rainey</i>	31
4 Thermal State and Evolution of the Earth Core and Deep Mantle <i>Stéphane Labrosse</i>	43
Part II: Structures, Anisotropy, and Plasticity of Deep Earth Materials	55
5 Crystal Structures of Core Materials <i>Razvan Caracas</i>	57
6 Crystal Structures of Minerals in the Lower Mantle <i>Juno K. Wicks and Thomas S. Duffy</i>	69
7 Deformation of Core and Lower Mantle Materials <i>Sébastien Merkel and Patrick Cordier</i>	89
8 Using Mineral Analogs to Understand the Deep Earth <i>Simon A. T. Redfern</i>	101
Part III: Physical Properties of Deep Interior	111
9 Ground Truth: Seismological Properties of the Core <i>George Helffrich</i>	113
10 Physical Properties of the Inner Core <i>Daniele Antonangeli</i>	121
11 Physical Properties of the Outer Core <i>Hidenori Terasaki</i>	129
Part IV: Chemistry and Phase Relations of Deep Interior	143
12 The Composition of the Lower Mantle and Core <i>William F. McDonough</i>	145
13 Metal-Silicate Partitioning of Siderophile Elements and Core-Mantle Segregation <i>Kevin Righter</i>	161

vi CONTENTS

14 Mechanisms and Geochemical Models of Core Formation <i>David C. Rubie and Seth A. Jacobson</i>	181
15 Phase Diagrams and Thermodynamics of Core Materials <i>Andrew J. Campbell</i>	191
16 Chemistry of Core-Mantle Boundary <i>John W. Hernlund</i>	201
17 Phase Transition and Melting in the Deep Lower Mantle <i>Kei Hirose</i>	209
18 Chemistry of the Lower Mantle <i>Daniel J. Frost and Robert Myhill</i>	225
19 Phase Diagrams and Thermodynamics of Lower Mantle Materials <i>Susannah M. Dorfman</i>	241
Part V: Volatiles in Deep Interior	253
20 Hydrogen in the Earth's Core: Review of the Structural, Elastic, and Thermodynamic Properties of Iron-Hydrogen Alloys <i>Caitlin A. Murphy</i>	255
21 Stability of Hydrous Minerals and Water Reservoirs in the Deep Earth Interior <i>Eiji Ohtani, Yohei Amaike, Seiji Kamada, Itaru Ohira, and Izumi Mashino</i>	265
22 Carbon in the Core <i>Bin Chen and Jie Li</i>	277
Index	289