

Contents

Foreword	vii
Editor's Preface	ix
CHAPTER 1 Manganese Rocks and Ores	1
CHAPTER 2 Manganese Carbonates in Modern Sediments	5
2.1 Manganese Carbonates in Open Oceanic Sediments.....	6
2.1.1 Isotopic Composition and Genesis of Calcium Rhodochrosite in the Sediments of the Guatemala Depression (Panama Basin, Pacific Ocean)	6
2.1.2 Manganese Carbonates in the Sediments of the Central American Trough (El Gordo Uplift, Pacific Ocean)	16
2.2 Manganese Carbonates in Modern Marine Sediments	18
2.2.1 Manganese Carbonates in the Sediments of the Baltic Sea	19
2.2.2 Ferromanganese Concretions in the Sediments of Onega Bay (White Sea, Russia)	27
2.3 Manganese Carbonates in Lake Sediments (on the Example of the Karelian Lakes).....	31
2.3.1 Ferromanganese Concretions in Lake Punnus-Yarvi	31
2.3.2 Ferromanganese Concretions in Lake Konchozero.....	52
2.4 Isotopic-Geochemical Regularities of the Formation of Manganese Carbonates in Modern Sediments	57
CHAPTER 3 Genetic Types, Classifications, and Models of Manganese-Ore Formation.....	63
3.1 Genetic Types and Classification of Manganese-Ore Deposits	63
3.2 Model Examples of the Formation of Manganese Deposits.....	67
3.2.1 Sedimentary-Diagenetic Deposits	67
3.2.2 Deposits of Hydrothermal-Sedimentary Genesis.....	197
3.2.3 Hydrothermal Deposits of Manganese	243
3.2.4 Epigenetic (Catagenetic) Deposits	247
3.2.5 Ferromanganese Deposits of Ferruginous-Siliceous Formations	324
3.2.6 Metamorphosed Deposits of Manganese	325
3.2.7 Deposits of Manganese of Weathering Crusts	331
3.3 Isotopic Particularities of the Formation of Manganese Rocks and Ores.....	342
CHAPTER 4 The Major Epochs and Phases of Manganese Accumulation in the Earth's History	353
4.1 Archean Metallogenic Period (3500–2500 Million Years).....	354

4.2	Proterozoic Metallogenic Period (2500–550 Million Years).....	358
4.2.1	Early-Middle Proterozoic Epoch (2500–1000 Million Years).....	358
4.2.2	Late Proterozoic (Neoproterozoic) Epoch (1000–550 Million Years).....	364
4.3	Phanerozoic Metallogenic Period (Zone).....	367
4.3.1	Early-Middle Paleozoic Epoch (Cm-D).....	367
4.3.2	Late Paleozoic Epoch (C-P).....	369
4.4	Mesozoic-Cenozoic Manganese Epoch (T-Pg).....	371
4.5	The Evolution of Manganese-Ore Formation in the Earth's History.....	378

CHAPTER 5 The Role of the Biosphere in Manganese-Ore Formation in the Geological History of the Earth.....384

Conclusion	390
Glossary of Terms Less Familiar to an English Audience.....	392
References.....	393
Index	419