

Contents

1	Introduction	1
1.1	What Is Economic Geology?	1
1.2	Peak Copper and Related Issues	5
1.3	What Is an Ore?	8
1.4	What Is an Ore Deposit?	11
1.5	Factors that Influence Whether a Deposit Can Be Mined	13
1.5.1	Tenor and Tonnage	13
1.5.2	Nature of the Ore	15
1.5.3	Location of the Deposit	16
1.5.4	Technical, Economical and Political Factors	17
	References and Further Reading	18
2	Classification, Distribution and Uses of Ores and Ore Deposits	19
2.1	Classifications of Ores	19
2.1.1	Classifications Based on the Use of the Metal or Ore Mineral	19
2.1.2	Classifications Based on the Type of Mineral	21
2.2	Classifications of Ore Deposits	24
2.2.1	A Classification Based on the Ore-Forming Process	26
2.3	Global Distribution of Ore Deposits	27
2.3.1	Geological Factors	28
2.4	Global Production and Consumption of Mineral Resources	34
2.5	World Trade in Mineral Resources	39
2.6	General Sources	42
	References	42
3	Magmatic Ore Deposits	43
3.1	Introduction	43
3.2	Chromite Deposits of the Bushveld Complex	43

3.3	Magnetite and Platinum Group Element Deposits of the Bushveld Complex	48
3.4	Magmatic Sulfide Deposits	49
3.4.1	Controls on the Formation of Magmatic Sulfide Liquid	50
3.4.2	Controls on the Segregation and the Tenor of Magmatic Sulfide Liquid	52
3.4.3	Kambalda Nickel Sulfide Deposits	53
3.4.4	Norilsk-Talnakh Nickel Sulfide Deposits	58
3.4.5	Other Ni Sulfide Deposits	62
3.5	Other Magmatic Deposits	65
3.5.1	Diamond	68
	References	71
4	Hydrothermal Deposits	73
4.1	Introduction	73
4.2	Key Factors in the Formation of a Hydrothermal Ore Deposit	73
4.2.1	Source of Metals	73
4.2.2	Source and Nature of Fluids	74
4.2.3	The Trigger of Fluid Circulation	77
4.2.4	A Site and a Mechanism of Precipitation	78
4.3	Examples of Hydrothermal Deposits and Ore-Forming Processes	79
4.3.1	Volcanogenic Massive Sulfide (VMS) Deposits	79
4.3.2	Porphyry Deposits	88
4.3.3	Sedimentary Exhalative (SEDEX) Deposits	94
4.3.4	Mississippi Valley Type (MVT) Deposits	98
4.4	Other Types of Hydrothermal Deposit	103
4.4.1	Stratiform Sediment-Hosted Copper Deposits	103
4.4.2	Uranium Deposits	104
4.4.3	Iron-Oxide Copper Gold (IOCG) Deposits	107
4.4.4	Gold Deposits	108
	References	111
5	Deposits Formed by Sedimentary and Surficial Processes	113
5.1	Introduction	113
5.2	Placer Deposits	115
5.2.1	Gold Placers	116
5.2.2	Beach Sands	122
5.2.3	Alluvial Diamonds	124
5.2.4	Other Placers: Tin, Platinum, Thorium-Uranium	125
5.3	Sedimentary Fe Deposits	126
5.3.1	Introduction	126
5.3.2	Types and Characteristics of Iron Deposits	127
5.3.3	Other Sedimentary Deposits: Mn, Phosphate, Nitrates, Salt ...	131

5.4 Laterites	132
5.4.1 Bauxite	132
5.4.2 Ni Laterites	136
5.5 Other Lateritic Deposits	138
5.6 Supergene Alteration	138
References	139
 6 The Future of Economic Geology	141
6.1 Introduction	141
6.2 Rare Earth Elements (REE)	142
6.3 Lithium	147
6.4 Mining and Mineral Exploration in the Future	150
 References	153
 Index	157