Contents

Preface
Chapter 1 Introduction 1
1.1 Basic Concepts of Coal and Gas Co-extraction 1
1.2 Coal and Gas Co-extraction Models in China 4
1.3 History of Coal and Gas Co-extraction Technology 15
1.4 Research Methods of Coal and Gas Co-extraction 21
1.5 Research and Development Directions of Coal and Gas Co-extraction 22
References 24
Chapter 2 Basic Theory of Coal and Gas Co-extraction 27
2.1 Coal and Rock Mass Structure and Mechanical Characteristics 27
2.2 Strata Movement and Stress Distribution Characteristics 45
2.3 Coal Seam Gas Occurrence and Flow Theory 59
2.4 Theory of Mining "O" Ring in Coal and Rock 76
2.5 Theory of High-level Annulus in Coal and Gas Co-extraction 90
References 132
Chapter 3 Design Principles of Coal and Gas Co-extraction 135
3.1 Design Principles of Coal Mine 135
3.2 Design Principles of Mining Area 149
3.3 Design Principles of Working Face 158
References 169
Chapter 4 Coal and Gas Co-extraction by Roadway Method 171
4.1 Model of Coal and Gas Co-extraction by Roadway 171
4.2 Gas Extraction in First-mined Coal Seam 175
4.3 Gas Extraction in Stress-relief Coal Seam 199
4.4 Construction and Maintenance of Special Roadway for Gas Extraction 220
References 232
Chapter 5 Coal and Gas Co-extraction Without Coal Pillars 234
5.1 Principle of Surrounding Rock Control in Retaining Roadway along Goaf 235

5.2 Surrounding Rock Control Technology for Retaining Roadway along Goaf ... 247
5.3 Method of Gas Extraction Without Coal Pillars ... 259
5.4 Safety Guarantee System for Mining Without Coal Pillars ... 267
References ... 276
Chapter 6 Coal and Gas Co-extraction by Ground Drilling ... 278
6.1 Pre-extraction of Coalbed Methane Technology Using Ground Drilling ... 279
6.2 Stress-Relief Gas Drainage Technology Using Ground Drilling ... 301
6.3 "Three-zone Linkage" Three-dimensional Gas Extraction Technology ... 319
References ... 325
Chapter 7 Gas Extraction System ... 327
7.1 Establishment of Mine Gas Extraction System ... 327
7.2 Equipment Selection of Gas Extraction System ... 332
7.3 Gas Extraction Drilling and Construction ... 348
7.4 Monitoring and Control of Gas Extraction System ... 373
7.5 Gas Extraction Standards ... 383
7.6 Gas Extraction Management ... 389
References ... 400
Chapter 8 Utilization of Coal Mine Gas ... 402
8.1 Classification of Coal Mine Gas Sources ... 402
8.2 Gas Safety Transportation and Pretreatment Technology ... 404
8.3 Low Concentration Gas Enrichment and Comprehensive Utilization ... 421
8.4 Resource Utilization of High Concentration Gas ... 434
8.5 Gas power generation Waste Heat Refrigeration Technology ... 445
References ... 452
Chapter 9 Analysis of Costs and Benefits of Coal and Gas Co-extraction ... 454
9.1 Costs Analysis of Coal and Gas Co-extraction ... 454
9.2 Benefits Analysis of Gas Drainage Utilization ... 465
References ... 472