GEOLOGY AND GEOCHEMISTRY OF HETAI GOLD FIELD, SOUTHERN CHINA

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华南河台金矿田地质地球化学

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PREFACE

The Hetai gold field is the biggest one of the same type discovered in southern China. It has attracted intensive attention of geologists and geochemists since its discovery in 1982, due to its economic and theoretical significance. The gold field, however, has hardly been unveiled in certain respects, and some important problems still remain to be solved despite of the numerous previous exploration and studies. This volume by Dr. Yongzhang ZHOU is the up-to-date comprehensive and systematic description and discussion of the Hetai gold field, laying emphases on his own researches. He succeeded in giving new ideas to some of the unanswered geological and geochemical puzzles of Hetai, and arrived at several important conclusions, which deepen the understanding of the gold field.

In this volume, a whole chapter is devoted to the Gusui bedded chert formation, an integral part of the Sinian (Precambrian) gold source strata, with detailed petrographic and petrochemical (including trace elements) studies. On the basis of these studies, the author concluded that the referred chert formation is of hydrothermal sedimentary origin, and proposed that the hydrothermal activities of a fossil geothermal system may have taken part in the preliminary enrichment of gold during the Sinian period. So far, the nature of the Hetai's chert has scarcely been tackled in geological literature. It should be added that the evidence cited by the author on the hydrothermal genesis of chert is quite convincing.

Another important contribution in the volume is Dr. Zhou's mathematical treatment on the redistribution of trace elements in source rocks. According to the proposed embedded sink mosaic model, the migration pattern of impurity trace elements in a thermal field is a fractal structure. There are two general tendencies of trace element migration. One is from the solid cells toward various weaknesses (sinks) of a geological domain, and the other is from a high temperature field toward lower temperature ones.

Detailed fluid inclusion studies give the author the idea to classify the fluid inclusions of the Hetai deposits into three compositional types. The low-salinity H_2O-CO_2 type represents the primary ore-forming hydrothermal solution, which unmixed into a moderate saline aqueous phase, as well as a non-saline CO_2-dominated phase. Based on his investigations, the author proposed possible sources and an entrapment mechanism for the ore-forming hydrothermal fluids.

While the description of the geological setting of the Hetai district was taken mainly from the previous investigators, the author did much research on the petrology and trace element geochemistry of the metamorphic rocks. The index minerals of the Hetai schist are

predominantly staurolite, sillimanite and almandine garnet, without kyanite and andalusite. This indicates a metamorphic temperature range from about 550° to 670°C and pressure range from 230 to 600 MPa. The protolith is mainly pelitic or semi-pelitic rocks, intercalated with bedded cherts.

The Hetai gold deposits occur in highly altered and deformed rocks. Practically all geologists working in this area agree that the ductile shear zones and the associated hydrothermal alteration played a fundamental role in the formation of the deposits. Dr. Zhou's achievement in this respect lies in his mass balance estimation using conserved element method. The results demonstrate that silica, precious metals and most thiophile elements were regularly introduced with the advance of alteration, and the mass addition reached its maximum in the ore bodies, with an average mass factor of 1 : 0.84.

Finally, the author established a sound metallogenetic mechanism of the Hetai gold field based on the polygenetic point of view. Sedimentation, regional metamorphism, granitic magmatism, deformation and hydrothermal activities all have their own share in building up the gold field. His mechanism is favored by various geological and geochemical approaches accomplished by him.

Besides its academic significance, presenting in English is one of the distinguishing features of this work, which makes it particularly valuable. As many economic geologists have noticed, China is one of the major contributors to the 1980s' increased stream of gold in the world, but the geological setting and theoretical studies of the gold deposits occurring in China are poorly known outside the country because most published literature is in Chinese, unreadable to most foreigners. Complete and systematic presentation in English is much needed to assist foreigners to obtain a knowledge of individual typical gold deposits of China. I wish that the publication of this work by the young author is a successful attempt in this respect.

涂光炽

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TABLE OF CONTENTS

ABSTRACT i
ACKNOWLEDGEMENTS iii
TABLE OF CONTENTS v
LIST OF FIGURES xii
LIST OF TABLES xvi
LIST OF PLATES xviii

INTRODUCTION 1

Chapter 1

GEOLOGICAL SETTING 7

§ 1 Yunkai Metamorphic Terrain (Gold Province) **7**
1.1 Geographic Location 7
1.2 Distribution of Gold Deposits 7
1.3 General Geology 12
1. Tectonic Background 12
2. Strata and Non-magmatic Rocks 12
3. Granites 15
1.3 Tectonic Evolution Outline 15
§ 2 Hetai Gold Field **16**

Chapter 2

REGIONAL METAMORPHIC ROCKS AND GRANITES 22

§ 1 Metamorphic Petrology and Facies **22**
1.1 Major Rock Types 22
1.2 Selected Characteristic Minerals 26
1. Staurolite 26
2. Sillimanite 27
3. Almandine Garnet 27
1.3 Mineral Parageneses 28
§ 2 Metamorphic Protolith and P - T Conditions **29**

2.1 Protolith 29
1. Petrologic Evidence 29
2. Geochemical Evidence 30
2.2 Metamorphic Temperature and Pressure 30
2.3 Fossil Geothermal Gradient 33
§ 3 Migmatites 34
3.1 Occurrence and Petrologic Characteristics 34
3.2 Geochemical Characteristics 35
1. Major Elements 35
2. Trace Elements 39
3. Rare Earth Elements 42
4. Partition Coefficients and Partial Melting 46
§ 4 Granites 46
4.1 Occurrence and Petrologic Characteristics 46
4.2 Chronology 48
4.3 Geochemical Characteristics 48
1. Major and Trace Elements 48
2. Rare Earth Elements 48
3. Strontium and Oxygen Isotopes 48
§ 5 Summary 52

Chapter 3

BEDDED CHERTS: PETROLOGIC AND GEOCHEMICAL CHARACTERISTICS AND ORIGIN 53

§ 1 Regional Occurrence and Petrology 55
1.1 Regional Occurrence 55
1.2 Mineralogy and Structures 55
1.3 Compaction and Recrystallization 60
1.4 Color 60
§ 2 Geochemistry of Major and Trace Elements 61
2.1 Bulk Compositions 61
2.2 Element Associations Obtained by Multivariate Statistics 65
1. Results of Correspondence Analysis 66
2. Results of Factor Analysis 66
3. Geochemical Implications 71
2.3 Al-Fe-Mn Ternary Diagram 77
§ 3 Rare Earth Elements 79

3.1 REE Abundance of NASC 79
3.2 Total REE Variability 80
3.3 REE Distribution Patterns 80
§ 4 Experiments and Observations Related to Formation of Silica Minerals 91
4.1 Solution of Silica Minerals and Behavior of Dissolved Silica 93
1. Solutions of Silica Minerals 93
2. Quartz Solubility at High Temperature 95
3. Behavior of Dissolved Silica in Active Geothermal System 97
4.2 Source of Silica 98
4.3 Deposition and Phase Transformation of Silica 98
4.4 Observations of Modern Hydrothermal Silica Deposits. 100
§ 5 Mechanism of Formation 102
5.1 General Consideration: Conceptional Model for Hydrothermal Activity 102
5.2 Precipitation of Silica 104
5.3 Intermittent Activities 105
5.4 Paleotectonic Setting 106
§ 6 Summary 107

Chapter 4

MIGRATION OF TRACE ELEMENTS DURING THERMAL EVENTS: A THEORETICAL EMBEDDED SINK MOSAIC MODEL 110

§ 1 Diffusion 111
1.1 Atomic Diffusion Mechanism 111
1.2 Types of Diffusion 112
1. Diffusion within Bulk Solids 112
2. Diffusion in Bulk Aqueous Solutions 113
3. Diffusion along Weaknesses in Bulk Solids 113
1.3 Equations and their Mathematical Solutions 114
1. Equations 114
2. Analytic Solutions 114
1.4 Embedded Sink Entrapment Mosaic Model 117
1. Sinks 117
2. Layering of Sinks and Embedded Sink Mosaic Structure 120

3. Self-similarity of Embedded Sink Mosaic Structure 123
§ 2 Infiltration and Flow of Aqueous Fluids 123
2.1 Relationship to diffusion 123
2.2 Mathematical Evidence 124
2.3 Infiltration Effect 125
§ 3 Orientation of Mass Transports 127
3.1 Affects of Temperature and Temperature Field on Diffusion 127
1. Temperature 127
2. Temperature Gradient 127
3. Convexity of Theraml Field and its Significance 128
3.2 Migration Paths and Reactivation of Elements 131
1. Migration Paths 131
2. Reactivation by Diffusion 132
3. Physical and Chemical Models of Reactivation 133
4. Factors Affecting Element Reactivation 133
§ 4 Mass Budget 134
4.1 Capacity of Country Rocks to Supply Ore Materials 134
4.2 Conjugate Geochemical Anomalies 134
§ 5 Summary 135

Chapter 5

DUCTILE SHEAR DEFORMATION AND HYDROTHERMAL ALTERATION RELATED TO ORE FORMATION 137

§ 1 Deformation Zones 137
1.1 Geometry of Deformation Zones 137
1. Occurrence 137
2. Planar Fabrics 141
3. Zonation 142
1.2 Petrography of Deformed Rocks 146
1. Microscopic Textures 146
2. Strained Quartz 147
1.3 Timing 148
§ 2 Hydrothermal Wall-Rock Alteration 148
2.1 Types and Characteristics 149
2.2 Gold Emplacement as an Integral Part of Alteration 150
1. Ores 150
2. Ore Minerals 152

3. Main Period of Gold Mineralization 152
2.3 Temporal Sequence of Hydrothermal Alteration 152
1. Quartz 152
2. Sulfides 153
3. Ankerite and Calcite 155
4. Position of Gold in Alteration Sequence 155
§ 3 Relations between Deformation and Hydrothermal Alteration 156
3.1 Spatial and Temporal Relationship 156
3.2 Control Mechanism of Alteration by Deformation 156
§ 4 Geochemical Behavior of elements in Alteration Zones 159
4.1 Invariant of Mass Change 159
4.2 Major Elements 162
4.3 Trace Elements 165
4.4 Rare Earth Elements 171
§ 5 Isotopic Characteristics of Ores 174
5.1 Sulfur Isotopes 174
5.2 Lead Isotopes 178
§ 6 Summary 178

Chapter 6

GEOCHEMISTRY OF HYDROTHERMAL FLUID INCLUSIONS 181

§ 1 Occurrence of Fluid Inclusions 181
§ 2 Classification and Relationships among Different Types 182
2.1 Compositional Types 182
1. CO_2-H_2O Inclusions 182
2. Aqueous Inclusions 185
3. CO_2-dominated Inclusions 185
2.2 Relationships of Fluid Inclusions and Gold Mineralization 185
1. Relation between Different Types of Fluid Inclusions 185
2. Relation Between Fluid Inclusions and Gold Mineralization 185
§ 3 Fluid Inclusion Microthermometry 186
3.1 Fluid Inclusion Technique 186

3.2 Homogenization Temperature 186
3.3 Last Melting Temperature of Ice and Salinity 193
1. CO_2-H_2O Inclusions 193
2. Aqueous Inclusions 193
3. CO_2-dominated Inclusions 193
3.4 Eutectic Temperature and Chemical System 193
1. Moderate-salinity Aqueous Inclusions 193
2. Low-salinity CO_2-H_2O Inclusions 196
3. Non-saline CO_2-dominated Inclusions 196
3.5 Ambient Pressure 196
§ 4 Oxygen and Hydrogen Isotopic Characteristics 197
§ 5 Geological and Geochemical Interpretations 199
5.1 Fluid Contemporaneity and Immiscibility 199
5.2 Temperature and Pressure Conditions at Fluid Entrapments 200
5.3 Implications and Mechanism 201
§ 6 Summary 203

Chapter 7

METALLOGENETIC MECHANISM 205

§ 1 Possible Sources of Gold 205
1.1 Potential Source Rocks 206
1.2 Geochemical Constraints 206
1. Trace Elements 206
2. Rare Earth Elements 206
3. Sulfur Isotopes 207
4. Lead Isotopes 207
1.3 Significance of Hydrothermal Sedimentation 208
§ 2 Role of Metamorphism 210
2.1 Spatial Correlation between Metamorphic Rock and Gold Deposit 210
2.2 Metamorphism and Redistribution of Gold 211
2.3 Behind the Relation Between Ore Grade and Metamorphism Grade 213
§ 3 Structural Controls 213
3.1 Regional Faults — Controlling the Distribution of Ore Deposits 213
3.2 Ductile Shear Zones — Localizing Gold Mineralization. 214

§ 4 Ore-forming Hydrothermal Fluids..... 214
4.1 Source of Fluid..... 214
4.2 Physiochemical Conditions..... 216
§ 5 Role of Granites..... 216
5.1 Spatial and Temporal Relationship with Gold Deposits..... 216
5.2 Magmatic Heat Source..... 216
§ 6 Transport and Precipitation of Gold..... 217
6.1 Transport..... 217
6.2 Precipitation..... 218
§ 7 Model of Gold Emplacement..... 218
7.1 Composite Relationship..... 218
7.2 History of Gold: Temporal Sequence..... 218

Chapter 8

CONCLUSIONS..... 221

REFERENCES..... 227

APPENDIX I SAMPLE DESCRIPTION..... 247
APPENDIX II ELEMENT ANALYSIS METHODS..... 258
APPENDIX III SUPPLEMENTARY TABLES..... 261
RÉSUMÉ EN FRANÇAIS..... 296
ABSTRACT IN CHINESE..... 304

LIST OF FIGURES

Figure 1.1 The Geographic map of western Guangdong Province.... 8

Figure 1.2 Tectonic outline and distribution of gold ore deposits of western Guangdong gold province..... 9

Figure 1.3 Tectonic background of the Hetai gold field..... 13

Figure 1.4 Regional geological map of the Hetai area..... 17

Figure 1.5 Distribution of shear zones and gold ore deposits in the Hetai gold field..... 18

Figure 1.6 The Shihui - Gusui geological and geochemical profile of western Guangdong Province..... 19

Figure 2.1 Distribution map of regional metamorphic (and migmatitic) rocks of the Shidong - Wuhe - Shijiang - Hetai district..... 23

Figure 2.2 The stability field diagram of minerals as a function of T - P..... 32

Figure 2.3 Correspondence analysis of the schists and migmatites occurring in the Hetai area, southern China..... 40

Figure 2.4 REE abundance distribution patterns (normalized to the chondrite) of the schists (B) and migmatites (A) occurring in the Hetai area, southern China..... 43

Figure 2.5 Comparison between the REE distribution patterns (normalized to the chondrite) of the average migmatite and the average schist of the Hetai area, southern China.. 44

Figure 2.6 REE distribution patterns of the granitic rocks in the Hetai area..... 49

Figure 2.7 Comparison of the REE patterns of the granites in the Hetai area..... 50

Figure 3.1 Distribution of known Zd bedded chert formation in western Guangdong Province..... 54

Figure 3.2 Correspondence analysis of the Gusui bedded chert, major elements..... 67

Figure 3.3 Correspondence analysis of the Gusui bedded chert, trace elements..... 69

Figure 3.4 Al - Fe - Mn ternary diagram showing the distinguishing between hydrothermal and hydrogenous sediments..... 78

Figure 3.5 REE abundance distribution pattern of the Gusui bedded cherts (normalized to the average NASC)..... 82

Figure 3.6 REE abundance distribution pattern of the Gusui bedded cherts (normalized to the average chondrite)..... 83

Figure 3.7 REE distribution pattern of selected seawaters (normalized to NASC)..... 85

Figure 3.8 Eh - pH diagram for the system Ce - C - O -H..... 87

Figure 3.9 REE abundance distribution patterns of typical hydrothermal and hydrogenous sediments (normalized to the average chondrite)..... 89

Figure 3.10 REE distribution patterns of some typical hydrothermal deposits normalized to NASC..... 91

Figure 3.11 Solubilities of various silica phases in water at the vapor pressure of the solution..... 94

Figure 3.12 Calculated solubilities of quartz in water up to 900°C at the indicated pressures..... 94

Figure 3.13 Comparison of calculated quartz solubilities in water and 5 and 8 weight percent aqueous NaCl at 500 bars and the indicated temperatures..... 96

Figure 3.14 Temperature vs. pressure (depth) diagram showing boiling curves, for pure water, 5 wt % aqueous NaCl, and 18 wt % aqueous NaCl..... 96

Figure 3.15 Conceptual model of a geothermal system responsible for the formation of the Gusui bedded cherts..... 103

Figure 4.1 Elementary atom jump mechanism within a crystal..... 111

Figure 4.2 Concentration-distance curve for an extended source of infinite extent..... 116

Figure 4.3 Concentration change profile of a migrating substance by diffusion derived from the sink entrapment model..... 116

Figure 4.4 Paths of migration of trace elements in the solid cell and boundary system..... 118

Figure 4.5 Sketch illustrating the distribution of potential energy of a diffusing particle within a bulk solid and its boundary aqueous solution film system 119

Figure 4.6 Similarity of the mosaic structures of different layers of traps 121

Figure 4.7 Distribution of concentration of the migrating substance during a convective diffusion from a semiinfinite bed 126

Figure 4.8(a) Isotherms of a simplified convex heat source 129

Figure 4.8(b) Isotherms of a simplified concave heat source 130

Figure 5.1(a) Geological map at the 240m level of the Gaocun ore deposit of the Hetai gold field 138

Figure 5.1(b) Vertical cross section #19 of the Gaocun ore deposit occurring in the Hetai gold field 139

Figure 5.1(c) Occurrence of the ductile shear zones of the Dapingding ore deposit of the Hetai gold field 140

Figure 5.2 Three main fabrics idealized in the shear deformation zone of the Hetai gold field 141

Figure 5.3 Zonation of deformed rocks cross the #11 ductile shear zone of Gaocun ore deposit 145

Figure 5.4 Zonation of alteration along the #0 section of the Gaocun ore deposit 151

Figure 5.5 Variation of gold grade along the #15 section of the Gaocun deposit 157

Figure 5.6 Ore-barren corridor structure 158

Figure 5.7 TiO_2-normalized AA/UA ratio pattern of the major elements of the average altered rock and ore rock (intensely altered rock) in the Hetai gold field 162

Figure 5.8 TiO_2-normalized AA/UA ratio pattern of the trace elements of the average altered rock and ore rock (intensely altered rock) in the Hetai gold field 169

Figure 5.9 REE abundance distribution patterns of the altered rocks (including ores, but not pegmatites) occurring in the deformation zones of the Hetai gold field 172