

Table of Contents

FOREWORD	iii
ABSTRACT	iv
ZUSAMMENFASSUNG.....	vi
TABLE OF CONTENTS	viii
LIST OF FIGURES	xi
LIST OF TABLES.....	xvi
1. INTRODUCTION	1
1.1. Metamorphic Rock-Hosted Gold Deposits in Indonesia	1
1.2. The Awak Mas Gold Prospect	3
1.3. Objectives	4
1.4. Materials and Methods	5
1.5. Orogenic Gold Deposit	6
2. REGIONAL GEOLOGY OF SULAWESI ISLAND.....	8
2.1. Geological Framework	9
2.1.1. West Sulawesi Plutono-Volcanic Arc.....	9
2.1.2. Central Sulawesi Metamorphic Belt.....	10
2.1.3. Eastern Sulawesi Ophiolite Belt.....	11
2.1.4. Banggai -Sula and Buton-Tukang Besi Blocks	11
2.2. Mineralization	12
2.2.1. North Sulawesi Metallogenic Province.....	13
2.2.2. West Sulawesi Metallogenic Province	14
2.2.3. East Sulawesi Metallogenic Province	15
2.2.4. Banggai-Sula Metallogenic Province	16
3. GEOLOGY OF AWAK MAS GOLD DEPOSIT	17
3.1. Host-Rock Lithology	18
3.1.1. Phyllites	19
3.1.2. Schists	22
3.2. Igneous Rocks	25
3.3. Metamorphism	28
3.4. Structural Geology.....	29
3.5. Summary.....	31

4. HYDROTHERMAL ALTERATION 33

4.1. Hydrothermal Alteration of Phyllites..... 33

4.1.1. *Distal Albite-Chlorite Alteration Zone*..... 33

4.1.2. *Proximal Albite-Ankerite-Pyrite Alteration Zone*..... 35

4.2. Hydrothermal Alteration of Schists 37

4.2.1. *Distal Albite-Quartz Alteration Zone* 37

4.2.2. *Proximal Albite-Ankerite-Pyrite Alteration Zone*..... 39

4.3. Delineation of The Alteration Zones 41

4.3.1. *Mineral Assemblages*..... 41

4.3.2. *Whole Rock Geochemistry*..... 43

4.3.3. *Mineral Chemistry* 44

4.4. Elemental Mobility 48

4.4.1. *Immobile Elements* 48

4.4.2. *Balanced Mineral Reactions*..... 49

4.5. Summary..... 59

5. GOLD MINERALIZATION..... 60

5.1. Quartz Vein Types 60

5.1.1. *Quartz-Ankerite-Albite Veins* 60

5.1.2. *Breccia*..... 60

5.1.3. *Quartz-Ankerite-Siderite Veins* 60

5.1.4. *Non-Mineralized Veins* 62

5.2. Ore Mineralogy 62

5.3. Sulfide Mineralogy and Gold Chemistry 65

5.4. Geochemistry of Mineralized Rocks 67

5.5. Summary..... 69

6. HYDROTHERMAL FLUID CHARACTERISTICS..... 70

6.1. Fluid Inclusions 70

6.1.1. *Fluid Inclusion Petrography* 70

6.1.2. *Microthermometry* 71

6.1.3. *Raman Spectroscopy*..... 74

6.1.4. *Interpretation*..... 75

6.2. Crush-Leach Analyses 76

6.3. Stable Isotopes 81

6.3.1. *Sulfur Isotope*..... 82

6.3.2. *Oxygen Isotope*..... 83

6.4. Summary..... 85

7. **DISCUSSION**..... **87**

7.1. Tectonic Evolution 87

7.2. Gold Mineralization..... 88

7.2.1. *Formation of Disseminated Gold Mineralization* 88

7.2.2. *Fluid-Rock Interaction* 89

7.2.3. *Fluid Composition* 90

7.2.4. *Fluid Origin*..... 90

7.2.5. *Transport and Precipitation* 91

7.3. Genetic Model for Awak Mas Gold Mineralization 92

8. **SUMMARY AND CONCLUSIONS** **95**

8.1. Implication for Gold Exploration Targeting in Eastern Indonesia..... 96

8.2. Recommendation 103

9. **REFERENCES** **105**

10. **APPENDICES**..... **121**

10.1. Mineral Abbreviations..... 121

10.2. Samples and Sections..... 121

10.3. QEMSCAN Analysis..... 124

10.4. Electron Micro Probe Analysis (EPMA) 126

10.4.1. *Silicates, Carbonates and Rutile*..... 129

10.4.2. *Sulfides and Gold*..... 155

10.5. Rock Geochemistry 160

10.5.1. *X-Ray Fluorescence spectrometer (XRF)*..... 160

10.5.2. *Inductivity Coupled Plasma Mass Spectrometer (ICP-MS)* 161

10.5.3. *Instrumental Neutron Activation Analysis (INAA)*..... 161

10.6. Fluid Inclusions 172

10.6.1. *Microthermometry* 172

10.6.2. *Raman Spectroscopy* 174

10.7. Crush-Leach Analysis 174

10.8. Isotopes Analyses 174

10.8.1. *Sulfur Isotope Analysis*..... 174

10.8.2. *Oxygen Isotope Analysis*..... 175