

PREFACE

ACKNOWLEDGEMENTS

ABSTRACT

CHAPTER I: INTRODUCTION 1

CHAPTER II: GEOLOGICAL SETTING , 7

1. Ophiolitic Assemblage. 8
 - 1.1. Serpentinites and Talc Carbonate Rocks. 8
 - 1.2. Amphibolites. 13
 - 1.3. Metagabbros. 14
2. Metasediments. 15
 - 2.1. Gneisses. 15
 - a) Meta-psammites 15
 - b) Biotite Gneisses. 17
 - 2.2. Metagreywackes and Metapelites 17
 - a) Wadi Allaqi Schists 18
 - b)WadiUmDomi-WadiUngatBelt 21
 - c) Mica Schists North of Gabal Muqsim andGabal Um Domi 22
 - 2.3. Amphibolite Bands within the Metasediments. 22
- 3.Calc-AlkalineAssemblage 24
 - 3.1 .Meta-andesites and Related Rocks. 24
 - a)WadiUngatMeta-andesites 24
 - b) Wadi Abu Fas -Wadi El Deiga Meta-andesites. 26
 - c) Meta-andesite Tuffs. 27 d) Actinolite Chlorite Epidote Schists 29
 - 3.2.GneissicTonalite 30
 - 3.3. Layered Gabbro Intrusions and Associated Peridotites 30
 1. Layered Gabbros. 30
 - a)Abu Fas Layered Gabbros 31
 - b)Um Domi Layered Gabbros 35
 - c) Wadi EL Deiga Layered Gabbros. 35
 2. Peridotites 37
 - 3.4.Late Granitoids 39
 - a)Wadi Allaqi Granitoids 39
 - b)Wadi El Deiga Granodiorites 40
4. Veins and Dykes 40
5. Trachyte Plugs 42

CHAPTER III: PETROGRAPHY 45

1. Ophiolitic Assemblage. 45
 - 1.1. Serpentinites and Talc-Carbonate Rocks. , 45
 - 1.2. Amphibolites. 46
 - 1.3. Metagabbros. 48
2. Metasediments. 51

2.1. Gneisses	51
a) Meta-psammites	51
b) Biotite Gneisses.	55
2.2. Metagreywackes and Metapelites	58
2.3. Amphibolite Bands within the Metasediments.	61
3. Calc-Alkaline Assemblage.	65
3.1 .Meta-andesites and Related Rocks.	65
a) Wadi Ungat Meta-andesites.	65
b) Wadi Abu Fas Meta-andesites	67
c) Meta-andesite Tuffs	68
d) Actinolite Chlorite Epidote Schists	71
3.2. Gneissic Tonalite	73
3.3. Layered Gabbro Intrusions and Associated Peridotites	76
1. Layered Gabbros.	76
i. Olivine Gabbro.	77
ii. Normal Gabbro	81
iii. Uralitized Gabbro	82
2. Peridotites	84
3.4. Late Granitoids	85
a) Granodiorites	85
b) Garnetiferous Muscovite Granites.	87
c) Biotite Muscovite Granites	90
Metamorphism	90

CHAPTER IV: GEOCHEMISTRY

Analytical Techniques	93
1. Ophiolitic Assemblage	94
1.1. Chemical Features.	94
a) Serpentinites	94
b) Metagabbros.	97
c) Amphibolites.	97
1.2. Petrochemical Classification of the Serpentinites and Metagabbros.	100
1.3. Normative Components	100
1.4. Niggli Values	104
1.5. Variation Diagrams.	108
1.6. Trace Elements.	112
1.7. Tectonic Setting of the Metagabbros and Amphibolites.	112
2. Metasediments.	122
2.1 .Chemical Features of the Gneisses and Mica Schists	122
2.2. Niggli Values	126
2.3. Variation Diagrams ,	130
2.4. Trace Elements.	136
2.5. Tectonic Setting of the Gneisses.	140
2.6. Petrogenesis of the Amphibolite Bands.	143
3. Calc-Alkaline Assemblage	145
3.1. Meta-andesites and Related Rocks.	145
1.1. Petrochemical Classification	145

1.2. Normative Components	147
1.3. Variation Diagrams	150
1.4. Trace Elements	152
1.5. Tectonic Setting of the Meta-andesites	155
3.2. Layered Gabbro Intrusions and Associated Peridotites	159
2.1. Chemical Features	162
a) Layered Gabbros	162
b) Peridotites	163
2.2. Normative Components	167
a) Layered Gabbros	167
b) Peridotites	168
2.3. Petrochemical Classification	169
2.4. Differentiation of Layered Gabbros	174
2.5. Variation Diagrams	176
2.6. Trace Elements	179
2.7. Tectonic Setting of Layered Gabbros	188
3.3. The Granitoid Rocks	197
3.1. Chemical Features	197
3.2. Petrochemical Classification	200
3.3. Normative Components	200
3.4. Niggli Values	206
3.5. Variation Diagrams	209
3.6. Trace Elements	214
3.7. Tectonic Setting of Granitoid Rocks	217

CHAPTER V: MINERAL CHEMISTRY 225

1. Clinopyroxene	225
2. Orthopyroxene	229
3. Plagioclase	231
4. Olivine	235
5. Amphiboles	235
Conclusion	240

CHAPTER VI: STRUCTURAL ELEMENTS AND EVOLUTION. 243

Introduction	243
Deformational Phases	245
1. Early Deformation (D1)	245
2. Regional Thrusting and Shearing (D2)	247
3. Regional Folding (D3)	249
4. Late Deformation (D4)	256
Faults	259

CHAPTER VII: SUMMARY AND CONCLUSIONS 259

REFERENCES 267

ARABIC SUMMARY at end