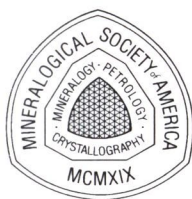


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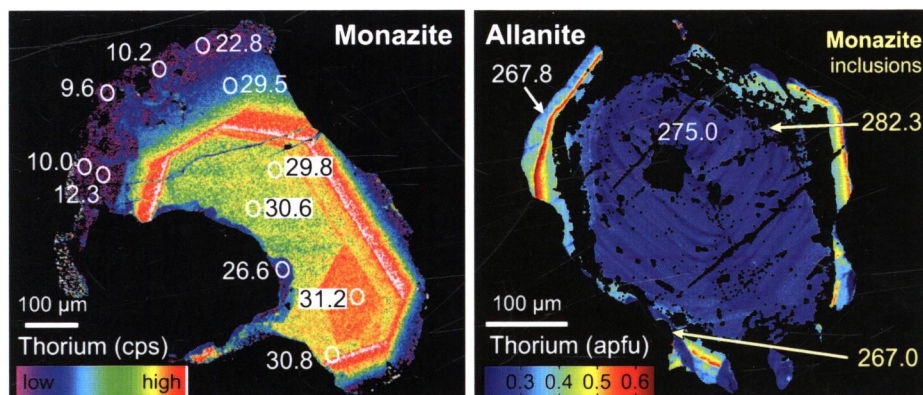
REVIEWS in
MINERALOGY &
GEOCHEMISTRY
Volume 83



PETROCHRONOLOGY: METHODS AND APPLICATIONS

EDITORS:

Matthew J. Kohn
Martin Engi & Pierre Lanari



MINERALOGICAL SOCIETY OF AMERICA
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RiMG Volume 83

CONTENTS

1–12	Significant ages— An introduction to petrochronology	<i>Engi M, Lanari P, Kohn MJ</i>
13–53	Phase relations, reaction sequences and petrochronology	<i>Yakymchuk C, Clark C, White RW</i>
55–102	Local bulk composition effects on metamorphic mineral assemblages	<i>Lanari P, Engi M</i>
103–152	Diffusion: Obstacles and opportunities in petrochronology	<i>Kohn MJ, Penniston–Dorland SC</i>
153–182	Electron microprobe petrochronology	<i>Williams ML, Jercinovic MJ, Mahan KH, Dumond G</i>
183–198	Petrochronology by laser–ablation inductively coupled plasma mass spectrometry	<i>Kylander–Clark ARC</i>
199–230	Secondary ionization mass spectrometry analysis in petrochronology	<i>Schmitt AK, Vazquez JA</i>
231–260	Petrochronology and TIMS	<i>Schoene B, Baxter EF</i>
261–295	Zircon: The metamorphic mineral	<i>Rubatto D</i>
297–328	Petrochronology of zircon and baddeleyite in igneous rocks: Reconstructing magmatic processes at high temporal resolution	<i>Schaltegger U, Davies JHFL</i>
329–363	Hadean zircon petrochronology	<i>Harrison TM, Bell EA, Boehnke P</i>
365–418	Petrochronology based on REE–minerals: monazite, allanite, xenotime, apatite	<i>Engi M</i>
419–441	Titanite petrochronology	<i>Kohn MJ</i>
443–467	Petrology and geochronology of rutile	<i>Zack T, Kooijman E</i>
469–533	Garnet: A rock–forming mineral petrochronometer	<i>Baxter EF, Caddick MJ, Dragovic B</i>
535–575	Chronometry and speedometry of magmatic processes using chemical diffusion in olivine, plagioclase and pyroxenes	<i>Dohmen R, Faak K, Blundy JD</i>

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Petrochronology: Methods and Applications

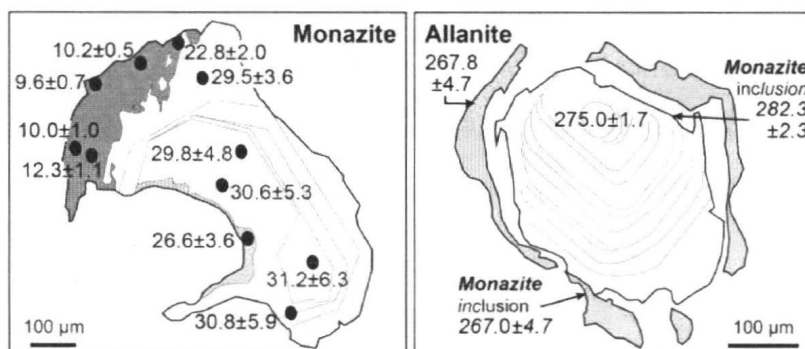
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Cover image: Thorium compositional maps of monazite (X-ray counts, cps) and allanite (atoms per formula unit, apfu). **Left:** Monazite crystal from a Greater Himalayan Sequence orthogneiss, central Nepal. Ellipses show locations of ion probe Th-Pb analyses. Core shows oscillations, probably formed during igneous crystallization. An age of ca. 27 Ma likely reflects prograde metamorphic overprinting (23 Ma age straddles two chemical domains). An age of 10–11 Ma reflects hydrothermal replacement; based on Corrie and Kohn (2011). **Right:** Allanite from the Cima d'Asta pluton, southern Alps (NE Italy). Magmatic allanite core with oscillatory zoning (dated at 275.0 ± 1.7 Ma (2s) by quadrupole LA-ICP-MS) formed by breakdown of early-magmatic monazite, preserved as relics (282.3 ± 2.3 Ma). During hydrothermal alteration Th-rich allanite rim (267.8 ± 4.7 Ma) formed, and its partial breakdown produced a new generation of monazite (267.0 ± 4.7 Ma); based on Burn (2016), compare Chapter 12, this volume.

Series Editor: Ian Swainson

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Petrochronology: Methods and Applications

83 *Reviews in Mineralogy and Geochemistry* **83**

FROM THE SERIES EDITOR

It has been a pleasure working with the volume editors and authors on this 83rd volume of *Reviews in Mineralogy and Geochemistry*. Several chapters have associated supplemental figures and or tables that can be found at the MSA website. Any future errata will also be posted there.

Ian P. Swainson, Series Editor
Vienna, Austria

PREFACE

“Thy friendship makes us fresh”

Charles, King of France, Act III, Scene III
(Henry VI, Part 1, by William Shakespeare)

Friendship does indeed make us fresh—fresh in our enthusiasm, fresh in our creativity, and fresh in our collaborative potential. Indeed, it is the growing friendship between petrology and geochronology that has given rise to the new field of petrochronology. This, in turn, has opened a new array of methods to investigate the history of the geologic processes that are encoded (oh, so tantalizingly close!) in rocks, and to develop a broad new array of questions about those processes.

All friendships have their initiations and growth periods, and the origins and evolution of petrochronology are discussed in some detail in the Introduction. In brief, petrochronology has been practiced for many decades, but was first labeled in 1997. The seeds for this specific volume were planted in 2013, watered in 2015, and (we hope) will thrive as a resource through the coming decades. Indeed, it is hard to envision any future work involving the geochronology of igneous or metamorphic rocks in the context of tectonics and petrogenesis that is not somehow petrochronologic.

Our overall goal in this volume is to capture a high-resolution image of the state of petrochronology during its ascendance, not simply for historical purposes, but rather to provide a solid foundation for the future. We have striven to corral the very best practitioners in the field in hopes that their wisdom can help train new generations of petrochronologists, and inspire them to greater enthusiasm and more diverse research directions. The high quality of each chapter suggests that we might just have succeeded in this endeavor!

We thank all the authors for their immense investment of time and resources to pull off the writing of this book. Similarly, the reviewers worked overtime to temper the sometimes soft metal of each chapter (often on regrettably short notice from the editors...). Ian Swainson rapidly turned around our manuscripts, hardly giving us rest between submission of final versions and editing proofs. We appreciate his remarkable attention to detail and unflagging patience. We also thank our governmental, corporate, society, and university sponsors who helped support the accompanying short courses: the US National Science Foundation, Cameca & Nu Instruments, ESI, Selfrag, the European Association of Geochemistry, The European Geosciences Union, the Geochemical Society, Société Française de Minéralogie et Cristallographie, Boise State University, and the University of Bern. Last, but not least, we thank our families and close friends for somehow managing to put up with us over the long two years that it took to bring about this book.

Matthew J. Kohn, Boise, Idaho, USA
Martin Engi, Bern, Switzerland
Pierre Lanari, Bern, Switzerland
March 2017

Petrochronology

83

Reviews in Mineralogy and Geochemistry

83

TABLE OF CONTENTS

1	Significant Ages—An Introduction to Petrochronology	
	<i>Martin Engi, Pierre Lanari, Matthew J. Kohn</i>	
	INTRODUCTION AND SCOPE.....	1
	SIGNIFICANCE OF AGE DATA.....	2
	PETRO-CHRONO-LOGICAL APPROACH AND AMBITION	3
	An example: P – T – t path for geodynamic and tectonic modeling	4
	Methods of choice, choice of methods	6
	EVOLUTION OR REVOLUTION?.....	9
	ACKNOWLEDGMENTS.....	10
	REFERENCES	11
2	Phase Relations, Reaction Sequences and Petrochronology	
	<i>Chris Yakymchuk, Chris Clark, Richard W. White</i>	
	INTRODUCTION	13
	MAJOR MINERALS.....	14
	Garnet.....	15
	Plagioclase.....	15
	ACCESSORY MINERALS.....	16
	Epidote.....	16
	Titanite.....	16
	Rutile	16
	Zircon	18
	Monazite.....	19
	Xenotime	21
	PHASE EQUILIBRIA MODELLING	21
	Bulk compositions.....	22
	Computational Methods	22
	Modelled P – T paths.....	23
	Modelling suprasolidus zircon and monazite dissolution	24
	SUBSOLIDUS PHASE RELATIONS AND REACTION SEQUENCES.....	25
	Metapelite.....	25
	Greywacke.....	28

SUPRASOLIDUS PHASE RELATIONS AND REACTION SEQUENCES.....	30
Metapelite.....	30
Greywacke.....	34
Average mid ocean ridge basalt.....	38
Summary of reaction sequence modelling	40
COMPLICATING FACTORS	41
Changes in effective bulk composition.....	41
Bulk composition and the suprasolidus behaviour of zircon and monazite	41
Effects of open system behaviour on accessory minerals	43
Inclusion/host relationships	44
CONCLUDING REMARKS.....	44
ACKNOWLEDGMENTS.....	45
REFERENCES	45

3 Local Bulk Composition Effects on Metamorphic Mineral Assemblages

Pierre Lanari, Martin Engi

INTRODUCTION AND SCOPE.....	55
THEORETICAL BASIS AND LIMIT OF FORWARD THERMODYNAMIC ANALYSIS	56
Gibbs free energy minimization	57
The concept of chemical equilibrium and its application to metamorphic rocks.....	58
Bulk rock composition vs reactive bulk composition.....	60
Open questions on bulk composition effects and the size of equilibration volume	60
PORPHYROBLAST GROWTH	61
Crystal nucleation and growth.....	63
Models of equilibrium and transport control.....	63
Fractionation of the reactive bulk composition during porphyroblast growth	65
Equilibrium crystallization models vs fractional crystallization models.....	66
Automated fractional crystallization models designed to retrieve <i>P–T</i> paths	
from chemical zoning.....	70
Crystal resorption and implications on fractional crystallization models	70
Timing of porphyroblast growth.....	71
BULK ROCK COMPOSITION EFFECTS ON MELT PRODUCTION	
AND ACCESSORY MINERALS.....	75
LOCAL REACTIONS AND FORMATION OF DOMAINAL ROCKS	77
Evidence of local reactions in discrete textural domains	78
Chemical potential gradients and element transfer between domains.....	79
Chemical potential gradient within domains.....	79
Size of the equilibrium volume versus scale of the model	79
QUANTITATIVE MAPPING OF THE LOCAL BULK COMPOSITION	
AS A BASIS FOR MODELING.....	80
Quantitative X-ray mapping.....	81
Strategy to derive local bulk composition from X-ray maps using XMAPTOOLS	81
Gibbs free energy minimization for the local bulk composition	83
Advantages of the micro-mapping approach.....	83
Potential artifacts affecting the local bulk composition estimates.....	85
Toward systematic quantitative trace element micro-mapping to address	
petrochronological problems.....	89
CONCLUSIONS AND PERSPECTIVES.....	90
ACKNOWLEDGMENTS.....	92

APPENDIX 1—LOCAL BULK COMPOSITIONS	
FROM OXIDE WEIGHT PERCENTAGE MAPS	92
REFERENCES	93

4 Diffusion: Obstacles and Opportunities in Petrochronology

Matthew J. Kohn, Sarah C. Penniston-Dorland

INTRODUCTION AND SCOPE.....	103
PART 1: DIFFUSION THEORY AND CONTROLS ON DIFFUSIVITY	104
Fick's laws	104
Multicomponent diffusion	105
Crystal-chemical controls on diffusion	106
Dependence of D on defects.....	109
PART 2: PETROCHRONOLOGIC CONCEPTS	111
Closure temperature.....	111
Geospeedometry	113
Diffusion in porous media: fluid–rock interaction	115
Major element thermometry	116
Trace element thermometry	119
Reaction rates	121
Diffusive resetting of isochrons.....	123
PART 3: EXAMPLES.....	125
Natural constraints on D	125
Geospeedometry from major element cation zoning.....	130
Geospeedometry from trace element zoning.....	131
Geospeedometry from chronologic zoning	132
Reaction rates	135
Timescales of magmatic processes from zoning in crystals.....	137
Magma ascent rates from zoning in glass.....	138
Duration of metamorphism.....	140
Fluid–rock interactions.....	141
FUTURE DIRECTIONS	142
Boundary conditions.....	144
Empirical diffusivities	144
Controls on diffusivities	144
Multiple element/isotope comparisons.....	144
Tectonics.....	145
Thermometry	145
ACKNOWLEDGMENTS.....	145
REFERENCES	145

5

Electron Microprobe Petrochronology

Michael L. Williams, Michael J. Jercinovic, Kevin H. Mahan, Gregory Dumond

INTRODUCTION	153
REACTION DATING.....	154
COMPOSITIONAL MAPPING, TRACE ELEMENT ANALYSIS, AND DATING BY ELECTRON MICROPROBE	155
Trace-element analysis by electron microprobe—analytical considerations	159

Analytical strategy	160
Analytical protocol	162
APPLICATIONS AND EXAMPLES OF EPMA PETROCHRONOLOGY	165
Textural and compositional correlation between accessory and major phases	165
Monazite–garnet–yttrium connection—	
Example 1: Legs Lake shear zone, Saskatchewan.....	165
Monazite–garnet–Y connection. Example-2: dating deformation	168
Other compositional/textural linkages with silicate assemblages	168
EPMA PETROCHRONOLOGY COMBINED WITH ISOTOPIC ANALYSIS.....	172
LOW-GRADE METAMORPHISM AND FLUID–ROCK INTERACTION.....	173
FUTURE TRENDS IN EPMA PETROCHRONOLOGY.....	174
Electron microprobe instrumental aspects.....	174
Thermochemical aspects	175
ACKNOWLEDGMENTS.....	176
REFERENCES	177

6 Petrochronology by Laser-Ablation Inductively Coupled Plasma Mass Spectrometry

Andrew R. C. Kylander-Clark

INTRODUCTION	183
VIRTUES OF LA-ICPMS	184
INSTRUMENTATION	185
Multi-Collector (MC) ICPMS	185
Single-collector (SC) ICPMS	185
Laser	186
TREATMENT OF UNCERTAINTIES.....	187
LASER ABLATION SPLIT STREAM (LASS).....	187
Plumbing for LASS	191
APPLICATIONS.....	192
LASS of metamorphic zircon.....	193
Single-shot LASS (SS-LASS) analysis of thin metamorphic zircon rims	193
Depth profiling of rutile.....	193
Petrochronology of detrital zircon.....	193
Monazite petrochronology.....	194
Titanite Petrochronology	194
CONCLUDING REMARKS.....	196
ACKNOWLEDGMENTS.....	196
REFERENCES	196

7 Secondary Ionization Mass Spectrometry Analysis in Petrochronology

Axel K. Schmitt, Jorge A. Vazquez

INTRODUCTION AND SCOPE.....	199
INSTRUMENTATION AND SAMPLE PREPARATION	201
Large-magnet radius ion microprobes for petrochronology, and complementary instrumentation	201

Large magnet radius instruments for geochronology and petrochronology.....	201
Sample preparation for petrochronology.....	206
QUANTITATIVE SIMS ANALYSIS	209
Relative sensitivity and instrumental mass fractionation factors	209
Two- and three-dimensional relative sensitivity calibrations	210
Specific analytical consideration and strategies for petrochronology	212
Data reporting for U–Th–Pb geochronology.....	217
COMPARING SIMS TO OTHER TECHNIQUES	220
CASE STUDIES FOR SIMS PETROCHRONOLOGY	221
OUTLOOK	223
Improved detection.....	223
Ion source developments	223
Sample holder design and automation.....	224
Final considerations.....	224
ACKNOWLEDGMENTS.....	225
REFERENCES	225

8

Petrochronology and TIMS

Blair Schoene, Ethan F. Baxter

INTRODUCTION	231
A BRIEF REVIEW OF TIMS GEOCHRONOLOGY	232
U–Pb ID-TIMS PETROCHRONOLOGY	234
Workflows in petrochronology	234
Limits on sample size and precision.....	234
Linking textures with dates in ID-TIMS U–Pb geochronology	240
Linking geochemistry with U–Pb ID-TIMS geochronology.....	242
SAMARIUM–NEODYMIUM ID-TIMS PETROCHRONOLOGY	246
Why ID-TIMS Sm–Nd for Petrochronology?.....	246
Sample Preparation for Sm–Nd TIMS Petrochronology.....	248
Sm–Nd Age Precision	252
THE FUTURE	255
ACKNOWLEDGMENTS.....	256
REFERENCES	256

9

Zircon: The Metamorphic Mineral

Daniela Rubatto

INTRODUCTION	261
PREAMBLE: THE MANY FACES AND NAMES OF METAMORPHIC ZIRCON.....	261
PETROGRAPHY OF ZIRCON.....	264
Textural relationships and inclusions	264
Internal zoning.....	266
Deformation.....	267
MINERAL CHEMISTRY	268
Th/U systematics	268

Rare earth elements	271
Ti-in-zircon thermometry	275
ISOTOPE SYSTEMATICS	276
U–Pb isotopes	277
Lu–Hf isotopes	279
Oxygen isotopes	280
PETROGENESIS	284
Diagenesis and low- <i>T</i> metamorphism	284
Metamorphic zircon and fluids at sub-solidus conditions	284
Metamorphic zircon and melts	286
Zircon forming reactions	287
CONCLUSIONS AND OUTLOOK	288
ACKNOWLEDGMENTS	289
REFERENCES	289

10 Petrochronology of Zircon and Baddeleyite in Igneous Rocks: Reconstructing Magmatic Processes at High Temporal Resolution

Urs Schaltegger, Joshua H.F.L. Davies

INTRODUCTION	297
WORKFLOW FOR ZIRCON PETROCHRONOLOGY	298
WORKFLOW FOR BADDELEYITE PETROCHRONOLOGY	301
PETROCHRONOLOGY OF ZIRCON	
IN INTERMEDIATE TO FELSIC SYSTEMS	301
Crystallization of zircon in intermediate-felsic, calc-alkaline melts	301
What does zircon chemistry tell us about magmatic processes?	308
Incremental assembly of magma batches in the upper crust— wrapping up what we have learned	314
PETROCHRONOLOGY OF BADDELEYITE AND ZIRCON	
IN MAFIC SYSTEMS	316
Crystallization of zircon in mafic (tholeiitic) melts	316
Chemical characteristics of zircon in mafic magmas	317
Baddeleyite geochronology	319
OUTLOOK	322
ACKNOWLEDGMENTS	322
REFERENCES	323

11 Hadean Zircon Petrochronology

T. Mark Harrison, Elizabeth A. Bell, Patrick Boehnke

INTRODUCTION	329
WHY STUDY HADEAN ZIRCONS?	330
Modes of investigation	332
JACK HILLS ZIRCONS	335
Isotopic results	335
Inclusions in zircon	339
Zircon geochemistry	342

OTHER WESTERN AUSTRALIAN HADEAN ZIRCON OCCURRENCES.....	347
Mt. Narryer.....	347
Churla Wells	347
Maynard Hills	347
Mt Alfred	348
NORTH AMERICAN HADEAN ZIRCON OCCURRENCES	348
Northwest Territory, Canada.....	348
Greenland	348
ASIAN HADEAN ZIRCON OCCURRENCES	348
Tibet.....	348
North Qinling	348
North China Craton	348
Southern China	348
SOUTH AMERICAN HADEAN ZIRCON OCCURRENCES	349
Southern Guyana	349
Eastern Brazil	349
OTHER PROPOSED MECHANISMS FOR FORMING	
HADEAN JACK HILLS ZIRCONS.....	349
Icelandic rhyolites	349
Intermediate igneous rocks.....	350
Mafic igneous rocks.....	350
Sagduction	351
Impact melts	351
Heat pipe tectonics	352
Terrestrial KREEP	352
Multi-stage scenarios.....	353
Summary	353
A LINK TO THE LATE HEAVY BOMBARDMENT?.....	354
BROADER IMPACTS OF HADEAN ZIRCONS	355
The role of Hadean zircons in geochemical innovation	355
The role of Hadean zircons in scientific thought.....	355
SUMMARY	356
ACKNOWLEDGMENTS.....	356
REFERENCES	356

12

Petrochronology Based on REE-Minerals: Monazite, Allanite, Xenotime, Apatite

Martin Engi

INTRODUCTION AND SCOPE.....	365
REE-minerals	365
CRYSTAL CHEMISTRY AND CONSEQUENCES	366
Monazite and xenotime	366
Apatite	369
Allanite	369
Sector zoning	371
Radiation damage	371
Diffusion and closure temperature	371
GEOOTHERMOBAROMETRY	373

Monazite and xenotime thermometry.....	373
Monazite–melt thermobarometry.....	374
TRACE ELEMENT GEOCHEMISTRY AND PETROGENESIS	375
Magmatic and partial melting range.....	375
Allanite	377
Subsolidus petrogenesis	378
Monazite and allanite	380
Effects of hydrous fluids.....	386
CHRONOLOGIC SYSTEMS.....	387
Spatial resolution <i>versus</i> age resolution	388
U–Th–Pb	388
Apatite	389
Allanite	389
CASE STUDIES.....	392
Selection, purpose.....	392
Single REE mineral species.....	392
Diversity of monazite	393
Apatite: testing old ideas in new light	393
Monadic monazite	395
Combining strengths: petrochronology from monazite plus allanite	399
Monazite at extreme conditions.....	401
Allanite: a hot finale	405
FUTURE DIRECTIONS	407
ACKNOWLEDGMENTS.....	408
REFERENCES	408

13

Titanite Petrochronology

Matthew J. Kohn

INTRODUCTION AND SCOPE.....	419
CRYSTAL CHEMISTRY OF TITANITE	420
Crystal structure and chemical substitutions	420
Thermometry and barometry.....	421
Sector zoning.....	422
IGNEOUS TITANITE	423
Petrogenesis.....	423
Trace element geochemistry	425
METAMORPHIC TITANITE.....	428
Petrogenesis.....	428
CHRONOLOGIC SYSTEMS.....	428
U–Pb	428
Sm–Nd	430
Diffusional biases	430
EXAMPLES	432
Temperature–time histories from single rocks	432
Temperature–time histories from multiple rocks	434
Pressure–time histories.....	435
Igneous processes	436
FUTURE DIRECTIONS	437

Diffusivities	437
Chemical domain structure	437
Models	437
Rutile activity	438
Common Pb	438
ACKNOWLEDGMENTS.....	438
REFERENCES	438

14

Petrology and Geochronology of Rutile

Thomas Zack, Ellen Kooijman

INTRODUCTION AND SCOPE.....	443
RUTILE OCCURRENCE.....	443
MICROSTRUCTURES OF RUTILE IN METAMORPHIC ROCKS	445
ZIRCONIUM-IN-RUTILE THERMOMETRY AND RUTILE-QUARTZ OXYGEN ISOTOPE THERMOMETRY	449
NIOBIUM AND Cr DISTRIBUTION AS SOURCE ROCK INDICATORS	452
URANIUM-LEAD GEOCHRONOLOGY	453
Uranium, Th and common Pb distribution in rutile.....	453
Analytics.....	454
Uranium-lead systematics in rutile	455
Cooling vs formation ages.....	457
Comparison with U-Pb titanite ages	459
CASE STUDY: THE IVREA ZONE.....	459
CONCLUDING REMARKS AND RECOMMENDATIONS	462
ACKNOWLEDGMENTS.....	463
REFERENCES	463

15

Garnet: A Rock-Forming Mineral Petrochronometer

E.F. Baxter, M.J. Caddick, B. Dragovic

INTRODUCTION	469
PETRO- OF GARNET	471
Textures of garnet—provider of tectonic context.....	472
Garnet as a pressure and temperature sensor.....	474
Garnet as a tracer of reaction pathways and fluid-rock interaction	483
CHRONO- OF GARNET	492
Garnet geochronology	493
The development of zoned garnet geochronology	509
Geospeedometry with garnet.....	510
EXAMPLES OF PETRO-CHRONOLOGY OF GARNET	512
Petrochronology of garnet: High pressure crustal metamorphism.....	512
Petrochronology of garnet: Geospeedometry and the timescales of granulite facies metamorphism.....	514
Petrochronology of garnet: Timescales of lower crustal melting	514
Petrochronology of garnet: Subduction zone dehydration	516

Petrochronology of garnet: Collisional tectonics and inverted metamorphic gradients.....	517
OUTLOOK	518
ACKNOWLEDGMENTS.....	518
REFERENCES	518

16 Chronometry and Speedometry of Magmatic Processes using Chemical Diffusion in Olivine, Plagioclase and Pyroxenes

Ralf Dohmen, Kathrin Faak, Jon D. Blundy

INTRODUCTION	535
Types of chronometers	536
Basic approach of diffusion chronometry	538
OLIVINE	540
Diffusion coefficients	541
Determination of magma residence times using Fe–Mg, Ca, Ni, and Mn diffusion.....	541
Growth vs. diffusive zoning: stable isotopes as diffusive fingerprints	544
Determination of cooling rates from Fe–Mg zoning in olivine.....	545
Determination of cooling rates from Ca zoning in olivine.....	548
Determination of cooling rates to constrain thermal structure of a crustal segment.....	550
Determination of magma ascent rates using H diffusion	550
PLAGIOCLASE	554
Diffusion coefficients and specifics for trace element diffusion in plagioclase	555
Determination of magma residence times using Mg or Sr diffusion.....	558
Determination of cooling rates using Mg diffusion	559
PYROXENES	561
Diffusion coefficients	561
Determination of magma residence times using Fe–Mg diffusion in Opx and Cpx	563
SYNOPSIS/PERSPECTIVES	566
ACKNOWLEDGMENTS.....	568
REFERENCES	568

RiMG Series

HISTORY OF RiMG	577
HOW TO PUBLISH IN RiMG.....	577