

Christoph A. Heinrich
Professor of Mineral Resources,
ETH Zürich and University of Zürich

Institute of Geochemistry and Petrology
Department of Earth Sciences, ETH Zürich
CH-8092 Zürich
Ph. direct +41- 44-632 6851, mobile +41-79-337 2426
Secretary B. Meyer: 632 3764, fax 632 1827
E-mail: heinrich@erdw.ethz.ch
<http://www.erdw.ethz.ch/>
www.geopetro.ethz.ch/research/orefluids



Home: Säumerstr. 54, 8800 Thalwil, Switzerland. Ph. +41-44 - 722 2249

Scientific publications see www.researcherid.com/rid/D-3921-2014, ~10'000 citations, h=57
~180 refereed ISI papers; 10 monographs, edited books and thematic issues

Personal	Born 8. September 1953 in Thalwil, Switzerland Swiss and Australian citizenship Married with Dr. Angela R. M. Heinrich – Beda, 3 children
Present position	Professor of Mineral Resources (Joint Full Professorship at ETH and University of Zürich)
Research interests and fields of expertise	<ul style="list-style-type: none">- Economic geology, mineralogy, petrology and geochemistry- Geology of ore deposits and hydrothermal systems- Geological transport processes and modelling of fluid - rock interactions- Thermodynamic and experimental studies of hydrothermal systems- Microanalysis and investigation of fluid and melt inclusions in minerals- Enhanced Geothermal Systems
Teaching	1 st year course 'Dynamic Earth'; service course 'Geology and Petrography' for civil & environmental engineers 3 rd year BSc course on 'Earth Resources' Graduate-level courses: 'Ore Deposits - Processes and Examples', 'Fluid & Melt Inclusions', 'Numerical Modelling of Hydrothermal Processes', 'Supply and Responsible Use of Mineral Resources' and ore-deposit field courses in the Alps and overseas Short courses to minerals industry, UNESCO etc.
Other professional and service functions	Head, Institute of Geochemistry and Petrology 1996 - 2000, 2004 – 2006, 2012-2014 Project Leader 'focusTERRA', ETH's new Earth Science exhibition and information centre opened in 2009

	<p>Earth Science Department – Head of Studies 2002 – 2007 responsible for introduction of BSc – MSc (Bologna Reform) President / Board Member, Paul Niggli Foundation, 2004 - 2018 Editorial Board Member, 'Chemical Geology' since 2008 Associate Editor 'Geofluids' 2010 - 2016 President, Swiss Society of Mineralogy & Petrology 2002-2007 Associate Editor, 'Economic Geology' 1993-2001 President / Member, Swiss Geotechnical Commission, since 1998 Councillor of SGA 2000-2005, 2009-2015 Councillor, Society of Economic Geologists SEG 1999-2003 Research Councillor, Swiss National Science Foundation, 2015-</p>
Professional memberships	<p>Fellow of the Society of Economic Geologists SEG Member of the American Mineralogical Society MSA Member of the Australian Geological Society AGS Member, Society for Geology Applied to Ore Deposits SGA</p>
Awards	<p>Paul Niggli Medal (Inaugural Award) 1988 SEG International Exchange Lecturer 2000 Silver Medal of the Society of Economic Geologists 2007 Penrose Gold Medal 2017 Huaying Grand Master Chair, Nanjing University, 2017 SEG Distinguished Lecturer 2018</p>
Previous positions and education	<p>1985-94 Principal Research Scientist Australian Geological Survey Organisation (AGSO), and Visiting Fellow, Australian National University (ANU), Collaborating w. Profs. M. Solomon, R.W. Henley, V.J. Wall 1988 Visiting Scientist, New Zealand Department of Scientific and Industrial Research, Wellington with Prof. T. M. Seward 1984/5 Research Contract with Mount Isa Mines Pty Ltd, for ore genesis project at Commonwealth Scientific and Industrial Research Organisation (CSIRO), Sydney 1983/4 Postdoctoral Scientist, CSIRO, Sydney (Nachwuchs- Forscher-Stipendium des Schweizerischen Nationalfonds) with Dr. R. Wilkins, P. J. Eadington, C. G. Ryan 1978-83 PhD studies at ETHZ (Dr. sc. nat. ETH Mai 1983) Petrology of high-pressure metamorphic rocks in the Alps (PhD supervisors Prof. V. Trommsdorff & A. B. Thompson) 1978 Field Geologist, Comalco Exploration Ltd, Adelaide 1973-78 BSc-MSc Geology & Petrology ETHZ (Dipl. sc. nat.) 1973 Assistant curator; military service; machine-shop practice 1966-72 High school Gymnasium Freudenberg, Zürich</p>
Major funded projects	<p>Un-interrupted project funding from Swiss National Science Foundation since 1996, 3-4 PhD students or postdocs on average; all grants see http://p3.snf.ch/person-66859-Heinrich-Christoph European Science Foundation project GEODE 1998-2004 Competitive PhD grants from ETHIIRA and minerals industry</p>

Monographs and edited works

- Liebscher A and Heinrich CA (2007) Fluid – fluid interactions in the Earth’s lithosphere. *MSA Reviews in Mineralogy and Geochemistry* 65, 430 p.
- Blundell D, Arndt N, Cobbold PR, and Heinrich CA (2005a) Geodynamics and ore deposit evolution in Europe: Thematic (GEODE) Issue of *Ore Geology Reviews* 27(1-4), 5-349.
- von Quadt A, Driesner T, and Heinrich CA (2004) Geodynamics and ore deposit evolution of the Alpine-Carpathian-Balkan-Dinaride orogenic system. *Schweizerische Mineralogische und Petrographische Mitteilungen* (GEODE Thematic Issue) 84, 1-212.
- Heinrich CA and Neubauer F (2002) Cu-Au-Pb-Zn-Ag metallogeny of the Alpine-Balkan-Carpathian- Dinaride geodynamic province. Thematic Issue of *Mineralium Deposita* 37(6-7), 533-677.
- Vielreicher R, Groves DI, Heinrich CA, and Walshe JL (1996) The conjunction of factors and processes that contribute to the formation of economic ore deposits. Guest editors to Special Issue "*The Wisdom of Solomon*", *Ore Geology Reviews* 10 (3-6).
- Jaireth S, Etminan H, and Heinrich CA (1990) Chemical modelling of lead - zinc transport and deposition in Mississippi Valley Type deposits of the Lennard Shelf, Canning Basin, Western Australia. *Bureau of Mineral Resources Record* 1990/38, 44 p.
- Heinrich CA, Henley RW, and Seward TM (1989) Hydrothermal Systems. Australian Mineral Foundation, Adelaide, 60 p.
- Heinrich CA (1987) The CSIRO-SGTE-THERMODATA package for thermodynamic computations at BMR. *Bureau of Mineral Resources Record* 1987/42, 44 p.
- Heinrich CA (1983) Die regionale Hochdruckmetamorphose der Adula-Decke, Zentralalpen, Schweiz. *Dissertation ETH Zürich* 7282, 220 p, 1 map (PhD thesis).
- Heinrich CA (1978) Strukturen und Metamorphose der Cima Lunga Serie; I Cima di Gagnone - Val Motto. *Unpubl. Diploma thesis, ETH Zürich* 41p, 2 maps (MSc Thesis).

Refereed Papers

- Argapadmi W, Toth E, Fehr M, Schönbächler M, Heinrich CA (2018) Silver isotopes as a source and transport tracer for gold: A reconnaissance study at the Sheba and New Consort gold mines in the Barberton Greenstone Belt, Kaapvaal Craton, South Africa. *Economic Geology*, 113, 1553-1570.
- Fiedrich AM, Martin HJ, Storck JC, Ulmer P, Heinrich CA, Bachmann O (2018) The influence of water in silicate melt on aluminium excess in plagioclase as a potential hydrometer. *Scientific Reports* 8, 12421, 8p.
- Schlegel T, Wagner T, Wälle M, Heinrich CA (2018) Hematite-breccia hosted iron oxide copper–gold deposits require magmatic fluid components exposed to atmospheric oxidation: Evidence from Prominent Hill, Gawler craton, South Australia. *Economic Geology*, 113, 597-644.
- Lecumberri-Sanchez P, Vieira R, Heinrich CA, Pinto F, Wälle M (2017) Fluid-rock interaction is decisive for the formation of tungsten deposits. *Geology* 45, 579-582.
- Schlöglova K, Wälle M, Heinrich CA (2017) LA-ICP-MS analysis of fluid inclusions: contamination effects challenging micro-analysis of elements close to their detection limit. *Journal of Analytical Atomic Spectrometry* 32, 1052-1063.
- Hsu Y-J, Zajacz Z, Ulmer P, Heinrich CA (2017) Copper partitioning between silicate melts and amphibole: Experimental insight into magma evolution leading to porphyry copper ore formation. *Chemical Geology* 448, 151-163

- Hennings SK, Wagner T, Ulmer P, Heinrich CA (2017) Fluid evolution of the Monte Mattoni mafic complex, Adamello batholith, Northern Italy: Insights from fluid inclusion analysis and thermodynamic modeling. *Journal of Petrology* 58, 1645-1670
- Buret Y, Wotzlaw J-F, Roozen S, Guillong M, von Quadt A, Heinrich CA (2017) Zircon petrochronological evidence for a plutonic-volcanic connection in porphyry copper deposits. *Geology* 45, 623-626.
- Wagner T, Fusswinkel T, Wälle M, Heinrich CA (2016) Microanalysis of Fluid Inclusions in Crustal Hydrothermal Systems using Laser Ablation Methods. *Elements* 12, 323-328
- Steele-MacInnis M, Ridley J, Lecumberri-Sanchez P, Schlegel TU, Heinrich CA (2016) Application of low-temperature microthermometric data for interpreting multicomponent fluid inclusion compositions. *Earth-Science Reviews* 159, 14-35.
- Large SJE, Bakker EYN, Weis P, Wälle M, Ressel M, Heinrich CA (2016) Trace elements in fluid inclusions of sediment-hosted gold deposits indicate a magmatic-hydrothermal origin of the Carlin ore trend. *Geology* 44, 1015-1018
- Rauchenstein-Martinek K, Wagner T, Wälle M, Heinrich CA, Arlt T (2016) Chemical evolution of metamorphic fluids in the Central Alps, Switzerland: insight from LA-ICPMS analysis of fluid inclusions. *Geofluids* 16, 877-908. **2016**
- Schlegel TU, Wagner T, Boyce A, Heinrich CA (2017) A magmatic source of hydrothermal sulfur for the Prominent Hill deposit and associated prospects in the Olympic iron oxide copper-gold (IOCG) province of South Australia. *Ore Geology Reviews* 89:1058-1090.
- Miron GD, Wagner T, Kulik DA, Heinrich CA (2016) Internally consistent thermodynamic data for aqueous species in the system Na-K-Al-Si-O-H-Cl. *Geochimica et Cosmochimica Acta* 187, 41-78
- Fekete S, Weis JP, Driesner T, Bouvier A-S, Baumgartner L, Heinrich CA (2016) Contrasting hydrological processes of meteoric water incursion during magmatic-hydrothermal ore deposition: An oxygen isotope study by ion probe. *Earth and Planetary Science Letters* 451, 263-271
- Berni GV, Heinrich CA, Lobato LM, Wall VJ (2016) Ore mineralogy of the Serra Pelada Au-Pd-Pt deposit and implications for ore-forming processes. *Mineralium Deposita* 51, 781-795.
- Sanchez-Alvaro P, Reich M, Driesner T, Cembrano J, Arancibia G, Perez-Flores P, Heinrich CA, Rowland J, Tardani D, Lange D, Campos E. (2016) The optimal window for seismically-enhanced gold precipitation in the epithermal environment. *Ore Geology Reviews* 79, 463-473
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- Buret Y, von Quadt AV, Peytcheva I, Heinrich CA (2016) From a long-lived upper-crustal magma chamber to rapid porphyry copper emplacement: Reading the geochemistry of zircon crystal at Bajo de la Alumbrera (NW Argentina). *Earth and Planetary Science Letters* 450, 120-131.
- Márquez-Zavalía FM, Heinrich CA (2016) Fluid evolution in a volcanic-hosted epithermal carbonate-base metal-gold vein system: Alto de la Blenda, Farallón Negro, Argentina. *Mineralium Deposita* 51(7):873-902
- Siegel K, Wagner T, Trumbull RB, Jonsson E, Matalin G, Wälle M, Heinrich CA (2016) Stable isotope (B, H, O) and mineral-chemistry constraints on the magmatic to hydrothermal evolution of the Varuträsk rare-element pegmatite (Sweden). *Chemical Geology* 421, 1-16
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- Gallhofer D, von Quadt A, Peytcheva I, Schmid SM and Heinrich CA (2015) Tectonic, magmatic, and metallogenic evolution of the Late Cretaceous arc in the Carpathian-Balkan orogen: *Tectonics*, 34, 1813-1836.
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- Berni GV, Heinrich CA, Lobato LM, Wall VJ, Rosiere CA, Freitas MA (2014) The Serra Pelada Au-Pd-Pt deposit, Carajas, Brazil: Geochemistry, mineralogy, and zoning of hydrothermal alteration. *Economic Geology* 109, 1883-1899. **2014**
- Gruen G, Weis P, Driesner T, Heinrich CA, de Ronde CEJ (2014) Hydrodynamic modeling of magmatic-hydrothermal activity at submarine arc volcanoes, with implications for ore formation. *Earth and Planetary Science Letters* 404, 307-318.
- Hurtig NC, Heinrich CA, Driesner T, Herrmann W, Wall V, Mathison I (2014) Fluid evolution and uranium (-Mo-F) mineralization at the Maureen deposit (Queensland, Australia): Unconformity-related hydrothermal ore formation with a source in the volcanic cover sequence. *Economic Geology* 109, 737-773.
- Kodera P, Heinrich CA, Wälle M, Lexa J (2014) Magmatic salt melt and vapor: Extreme fluids forming porphyry gold deposits in shallow subvolcanic settings. *Geology* 42, 495-498.
- Rauchenstein-Martinek K, Wagner T, Wälle M, Heinrich CA (2014) Gold concentrations in metamorphic fluids: A LA-ICPMS study of fluid inclusions from the Alpine orogenic belt. *Chemical Geology* 385, 70-83.
- Wälle M, Heinrich CA (2014) Fluid inclusion measurements by laser ablation sector-field ICP-MS. *Journal of Analytical Atomic Spectrometry* 29, 1052-1057.
- Weis P, Driesner T, Heinrich CA (2014) Temporal and spatial relationships between porphyry and epithermal systems: a hydrological perspective. *Mineral Deposit Research for a High-Tech World, SEG Conference, Denver, Colorado* (invited) 1-4, 903-905.
- Zwahlen C, Cioldi S, Wagner T, Rey R, Heinrich C (2014) The porphyry Cu-(Mo-Au) deposit at Altar (Argentina): Tracing gold distribution by vein mapping and LA-ICP-MS mineral analysis. *Economic Geology* 109, 1341-1358.
- Heinrich CA, Candela PA (2014) Fluids and Ore Formation in the Earth's Crust. In: Holland H.D. and Turekian K.K. (eds.) *Treatise on Geochemistry, Second Edition*. Volume 13 (S. D. Scott, ed.), Oxford: Elsevier, 1-28.
- Weis P, Driesner T, Heinrich CA (2013) Temporal and spatial relationships between porphyry and epithermal systems: a hydrological perspective. In: Jonsson E (ed.) *Proceedings of the 12th Biennial SGA Meeting*, Uppsala, Sweden, 903-905.
- 2013**
- Lehmann S, Barcikowski J, von Quadt A, Gallhofer D, Peytcheva I, Heinrich CA, Serafimovski T (2013) Geochronology, geochemistry and isotope tracing of the Oligocene magmatism of the Buchim – Damjan - Borov Dol ore district: Implications for timing, duration and source of the magmatism. *Lithos* 180, 216-233.
- Stefanova E, Driesner T, Zajacz Z, Heinrich CA, Petrov P, Zlati V (2013) Melt and fluid inclusions in hydrothermal veins: The magmatic to hydrothermal evolution of the Elatsite porphyry Cu-Au deposit, Bulgaria. *Economic Geology*, 109, 1359-1381.
- Harris CR, Pettke T, Heinrich CA, Rosu E, Woodland S, Fry B (2013) Tethyan mantle metasomatism creates subduction geochemical signatures in non-arc Cu-Au-Te mineralizing magmas, Apuseni Mountains (Romania). *Earth and Planetary Science*

Letters 366, 122-136.

- Kaiser Rohrmeier M, von Quadt A, Driesner T, Heinrich CA, Handler R, Ovtcharova M, Ivanov Z, Petrov P, Sarov S, Peytcheva I (2013) Post-orogenic extension and hydrothermal ore formation: High-precision geochronology of the Central Rhodopian Metamorphic Core Complex (Bulgaria-Greece). *Economic Geology* 108, 691-718.
- Kolb M, Von Quadt A, Peytcheva I, Heinrich CA (2013) Timing of the mineralized Upper Cretaceous magmatic complexes in East Serbia: Implications for the geodynamic evolution of the Apuseni-Banat-Timok-Srednogie (ABTS) belt. *Swiss Journal of Geosciences* in revision.
- Kolb M, Von Quadt A, Peytcheva I, Heinrich CA, Fowler SJ, Cvetkovic V. (2013) Adakite-like and normal arc magmas: Distinct fractionation paths in the East Serbian segment of the Balkan-Carpathian arc. *Journal of Petrology* 54, 421-451.
- Fusswinkel T, Wagner T, Wälle M, Wenzel T, Heinrich CA, Markl G (2013) Fluid mixing forms basement-hosted Pb-Zn deposits: Insight from metal and halogen geochemistry of individual fluid inclusions. *Geology* 41, 679-682.
- Seo JH and Heinrich CA (2013) Selective copper diffusion into quartz-hosted vapor inclusions: evidence from other host minerals, driving forces, and consequences for Cu-Au ore formation. *Geochimica et Cosmochimica Acta* 113, 60-69.
- Miron GD, Wagner T, Wälle M, Heinrich CA (2013) Major and trace-element composition and pressure-temperature evolution of rock-buffered fluids in low-grade accretionary-wedge metasediments, Central Alps. *Contributions to Mineralogy and Petrology* 165, 981-1008.
- Steinberger I, Hinks D, Driesner T, Heinrich CA (2013) Source Plutons driving porphyry copper ore formation: Combining geomagnetics, thermal constraints and chemical mass balance to quantify the magma chamber beneath the Bingham Canyon deposit. *Economic Geology* 108, 605-624.
- Weis P, Driesner T, Heinrich CA (2012) Porphyry-copper ore shells form at stable pressure – temperature fronts within dynamic fluid plumes. *Science* 338, 1613-1616. **2012**
- Gruen G, Weis P, Driesner T, de Ronde CEJ, Heinrich CA (2012) Fluid flow patterns at Brothers volcano, southern Kermadec arc: Insights from geologically constrained numerical simulations. *Economic Geology* 107, 1595-1611.
- Schlegel, TU, Wälle M, Steele-McInnis M, Heinrich CA (2012) Accurate and precise quantification of major and trace element compositions of calcic-sodic fluid inclusions by combined microthermometry and LA-ICPMS analysis. *Chemical Geology* 334, 144-153.
- Georgiev S, von Quadt A, Heinrich CA, and Peytcheva I (2012) The time evolution of the Eastern Srednogie magmatic arc revealed by U-Pb zircon ages: an integrated U-Pb ID-TIMS and U-Pb LA-ICPMS study. *Lithos* 154, 53-67.
- Seo JH, Guillong M, Heinrich CA (2012) Separation of molybdenum and copper in porphyry deposits: The roles of sulfur, redox, and pH in ore mineral deposition at Bingham Canyon. *Economic Geology* 107, 333-356.
- Heinrich CA, Meier D, Erni M, von Quadt A, Márquez – Zavalía F (2011) Life-times and scales of Cu-Au-mineralizing magmatic-hydrothermal processes: Farallón Negro (Argentina). In: Campos E. et al. (Eds.) *Let's Talk Ore Deposits*, Proceedings of the 11th SGA Biennial Meeting, Antofagasta, Chile, Keynote, 3-6. **2011**
- Catchpole H, Kouzmanov K, Fontbote L, Guillong M, Heinrich CA (2011) Fluid evolution in zoned Cordilleran polymetallic veins – Insights from microthermometry and LA-ICP-MS of fluid inclusions. *Chemical Geology* 281, 293-304.
- Pettke T, Oberli F, Audétat A, Wiechert U, Harris CR, Heinrich CA (2011) Quantification of transient signals in multiple collector inductively coupled plasma mass spectrometry: accurate lead isotope ratio determination by laser ablation of individual fluid inclusions. *Journal of Analytical Atomic Spectrometry* 26, 475-492.

- von Quadt A, Erni M, Martinek K, Moll M, Peytcheva I, Heinrich CA (2011) Zircon crystallization and the lifetimes of ore-forming magmatic-hydrothermal systems. *Geology* 39, 731-734.
- Seo JH, Guillong M, Aerts M, Zajacz Z, Heinrich CA (2011) Microanalysis of S, Cl, and Br in fluid inclusions by LA-ICP-MS. *Chemical Geology* 284, 35-44.
- Kouzmanov K, Pettke T, Heinrich CA (2010) Direct Analysis of ore-precipitating fluids, Combined IR microscopy and LA-ICP-MS study of fluid inclusions in opaque ore minerals. *Economic Geology* 105, 351-373.

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- Pettke T, Oberli F, Heinrich CA (2010) The magma and metal source of giant porphyry-type ore deposits, based on lead isotope microanalysis of individual fluid inclusions. *Earth and Planetary Science Letters* 296, 267-277.
- Von Quadt A, Peytcheva I, Sarov S, Heinrich C (2010) Cretaceous magmatic evolution of the Srednogie zone (Bulgaria) and the continuous evolution into the Rhodope Massif (Bulgaria, Greece). *Geologica Balkanica* 39, 408-409.
- Zajacz Z, Seo JH, Candela PA, Piccoli PM, Heinrich CA, Guillong M (2010) Alkali metals control the release of gold from volatile-rich magmas. *Earth and Planetary Science Letters* 297, 50-56.
- Landtwing MR, Furrer C, Redmond PB, Pettke T, Guillong M, Heinrich CA (2010) The Bingham Canyon Porphyry Cu-Mo-Au Deposit. III. Zoned copper-gold ore deposition by magmatic vapor expansion. *Economic Geology* 105, 91-118.
- Gruen G, Heinrich CA, Schroeder K (2010) The Bingham Canyon Porphyry Cu-Mo-Au Deposit. II. Vein geometry and ore shell formation by pressure-driven rock extension. *Economic Geology* 105, 69-90.
- Murakami H, Seo JH, Heinrich CA (2010) The relation between Cu/Au ratio and formation depth of porphyry-style Cu-Au ± Mo deposits. *Mineralium Deposita* 45, 11-21.

Best Paper Award

- Heinrich CA, Guillong M, Pettke T, Pudack C, Seo JH (2010) Low-salinity fluids at the porphyry-to-epithermal transition: from magmatic vapour to aqueous liquid. In: Williams PJ, et al. (Eds.) *Smart Science for Exploration and Mining*, Proceedings of the 10th Biennial SGA Meeting, Townsville, Australia, 14-16.
- Weis P, Driesner T, Heinrich CA, Coumou D, Geiger S (2010) Flow of brine and vapour in subaerial and submarine magmatic hydrothermal systems. In: Williams PJ, et al. (Eds.) *Smart Science for Exploration and Mining*, Proceedings of the 10th Biennial SGA Meeting, Townsville, Australia, 873-875.

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- Zajacz Z, Hanley JJ, Heinrich CA, Halter WE, Guillong M (2009) Diffusive reequilibration of quartz-hosted silicate melt and fluid inclusions: Are all metal concentrations unmodified? *Geochimica et Cosmochimica Acta* 73, 3013-3027.
- Su WC, Heinrich CA, Pettke T, Zhang XC, Hu RZ, Xia B (2009) Sediment-hosted gold deposits in Guizhou, China: Products of wall-rock sulfidation by deep crustal fluids. *Economic Geology* 104, 73-93.
- Meier DL, Heinrich CA, and Watts MA (2009) Mafic dikes displacing Witwatersrand gold reefs: Evidence against metamorphic-hydrothermal ore formation. *Geology* 37, 607-610.

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- Guillong M, Latkoczy C, Seo JH, Günther D, Heinrich, CA (2008) Determination of sulfur in fluid inclusions by laser ablation ICP-MS. *Journal of Analytical Atomic Spectrometry* 22, 1488-1494.
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- Peytcheva I, von Quadt A, Georgiev N, Ivanov Z, Heinrich CA, Frank M (2008) Combining trace-element compositions, U-Pb geochronology and Hf isotopes in zircons to unveil complex calcalkaline magma chambers as inferred by mixed gabbros and granodiorites in the Upper Cretaceous Srednogorie zone (Bulgaria). *Lithos* 104, 405-427.
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- Simon AC, Pettke T, Candela PA, Piccoli PM, and Heinrich CA (2007) The partitioning behavior of As and Au in S-free and S-bearing magmatic assemblages. *Geochemica et Cosmochimica Acta* 71, 1764-1782.
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