

CURRICULUM VITAE

Jeffrey C. Alt
Department of Geological Sciences
The University of Michigan
1000 North University
Ann Arbor MI 48109-1005 USA

EDUCATION

Ph.D. Marine Geology and Geophysics, University of Miami, 1984
M.S. Marine Geology and Geophysics, University of Miami, 1981
B.S. Honors in Geology and Mineralogy, University of Michigan, 1975

PROFESSIONAL POSITIONS

Research Scientist, Dept. Geological Sciences, Univ. Michigan, 1998-present
Associate Research Scientist, Dept Geol. Sciences, Univ. Michigan, 1991- 1998
Visiting Professor, Institut de Geologie, Universite Louis Pasteur, Strasbourg, France
3/96-8/96
Assistant Research Scientist, Dept. Geol. Sciences, Univ. Michigan, 1989-1991
Senior Research Scientist, Washington University in St. Louis, 1987-1989
Research Scientist, Washington University in St. Louis, 1985-1987

HONORS AND AWARDS

2009-2010 Distinguished Lecturer, Consortium for Ocean Leadership
2004 Fellow of the Geological Society of America
2001 Research Scientist Achievement Award, LS&A, Univ. Michigan
1999 Excellence in Research Award, LS&A, Univ. Michigan
1983-1984 Koczy fellowship, University of Miami

RESEARCH INTERESTS

Geochemistry of submarine hydrothermal systems and subduction zones; utilization of stable isotopes to trace water-rock interactions and the subsurface biosphere.

FIELD WORK:

Includes participation on ten hard-rock Ocean Drilling Program expeditions
Co Chief Scientist on IODP Exp 312, Superfast Crust, E. Pacific
Co-chief scientist on ODP Leg 148, Hole 504B in E. Pacific
Legs 83, 111, 137, and 140 to Hole 504B in E. Pacific
Leg 158 TAG active massive sulfide deposit, Mid-Atlantic Ridge
Leg 176 Hole 735B Lower oceanic crust, SW Indian Ocean
Leg 185 Old Pacific Crust, W. Pacific
Leg 206 Superfast Crust, E. Pacific
Participant on two ALVIN cruises (21°N East Pacific Rise; East Pacific Seamounts)
Apennine and Alpine ophiolites (N. Italy, Switzerland)
Troodos Ophiolite, Cyprus
Yellowstone Lake, WY

INVITED LECTURES

- 2010 Rice University, Houston, TX
- UC Davis, Davis, CA
- Washington State University, Pullman, WA
- Colby College, Waterville, ME
- Michigan Tech, Houghton, MI
- 2009 University of Illinois at Chicago
- Calvin College, Grand Rapids, MI
- Southern Illinois University, Carbondale, IL
- 2004 European Union of Geosciences, Florence Italy
- 2003 Woods Hole Oceanographic Institution, MA
- 2001 GeoForschungZentrum, Potsdam, Germany
- 2001 The University of Michigan, Ann Arbor
- 1999 Petrologisches Institut der Universität Basel, Switzerland
- 1999 Department of Geology, Barcelona, Spain
- 1998 JOI/ILP Hydrogeology conference, UC Santa Cruz
- 1998 GSA Penrose Conference, Ophiolites and Ocean Crust, Tomales Bay, CA,
- 1998 University of Tasmania, Hobart, Australia
- 1997 Geological Survey of Canada, Ottawa, Canada
- 1997 The Subsurface Biosphere in Oceanic Crust, AGU, Washington, D.C.
- 1996 Max-Planck Institut für Chemie, Mainz, FRG
- 1996 Institut de Géologie, Université Louis Pasteur, Strasbourg, France
- 1996 ODP-Interridge workshop, Woods Hole, MA,.
- 1994 Department of Geology, Northwestern University, Evanston, IL
- 1993 RIDGE Theoretical Institute, Big Sky, Montana
- 1992 IGCP Project 294 (Very low grade metamorphism), Univ. California, Davis, CA,
- 1989 Department of Geology, University of Illinois, Champaign-Urbana, IL
- 1988 U.S. Geological Survey, Anchorage, AK,
- 1987 U.S. Geological Survey, Reston, VA

COMMUNITY SERVICE

- Associate Editor, *Geochimica et Cosmochimica Acta*, 2005-present
- NSF OCE-Marine Geology and Geophysics Review Panel 1995-1998; 2003-2004
- JOIDES Sedimentary and Geochemical Processes Panel (1989-1993)
- RIDGE Steering Committee (1993-1996)

TEACHING

- Courses: GS 116 Geology in the Field; GS 205 The Dynamic Earth; GS 104 Ice Ages;
GS 154 Ocean Resources; GS 449 Marine Geology
- Student Supervision/Committees: Susan Alford MS, 2009;
Committee member for 13 graduate students
- Post-Doctoral Researcher Supervision:
Alexandra Turchyn, (PhD, Harvard University, 2006), 2007-2008.
Rosalind Coggon (PhD Southampton National Oceanography Centre 2006),
2006-2007
Damon A.H. Teagle (PhD Cambridge University 1993), 1993-1997.
Anna Martini (PhD University of Michigan, 1997) 1997-1998

PUBLICATIONS

2010

- Alt, J.C., C. Laverne, R. Coggon, D.A.H. Teagle, N. Banerjee, S. Morgan, C. Smith-Duque, M. Harris, L. Galli, 2010. The Subsurface Structure of a Submarine Hydrothermal System in Ocean Crust Formed at the East Pacific Rise, ODP/IODP Site 1256. *Geochem. Geophys. Geosyst.*, in Press.
- Coggon, R.M., D.A.H. Teagle, C.E. Smith-Duque, J.C. Alt, M.J. Cooper, 2010. Reconstructing Past Seawater Mg/Ca and Sr/Ca from Mid-Ocean Ridge Flank Calcium Carbonate Veins, *Science*, 327, 5969; 1114-1117.
- Lever, M.A., O. Rouxel, J. Alt, N. Shimizu, S. Ono, F. Inagaki, and A. Teske, 2010. Functional gene and ³⁴S-Isotopic Evidence of Microbial Methane and Sulphur Cycling in 3.5 Million-Year-Old Buried Ridge Flank Basalt, *Science*, in Revision.

2009

- Tominaga, M., D.A.H. Teagle, J.C. Alt, and S. Umino, 2009. Determination of the volcanostratigraphy of oceanic crust formed at superfast spreading ridge: Electrofacies analyses of ODP/IODP Hole 1256D. *Geochem. Geophys. Geosyst.*, V 10, no. 9, Q01003, doi:10.1029/2008GC002143
- Williams, H., S.G. Nielsen, C. Renac, W.L. Griffin, S.Y. O'Reilly, Catherine A. McCammon, Norman Pearson a, Fanus Viljoen, J.C. Alt, A.N. Halliday, 2009. Fractionation of oxygen and iron isotopes by partial melting processes: Implications for the interpretation of stable isotope signatures in mafic rocks, *Earth and Planetary Science Letters* 283 (2009) 156–166

2008

- Rouxel, O., S. Ono, J. Alt, and D. Rumble, 2008. Sulfur isotope evidence for microbial sulfate reduction in Altered Oceanic Basalts at ODP Site 801, *Earth and Planetary Science Letters* 268, 110–123
- Umino, S., L. Crispini, P. Tartarotti, D.A.H. Teagle, J. Alt, S. Miyashita, N.R. Banerjee, IODP Expedition 309&312 Scientific Parties, 2008. Origin of the sheeted dike complex at superfast spread East Pacific Rise revealed by deep ocean crust drilling at Ocean Drilling Program Hole 1256D, *Geochem. Geophys. Geosyst.*, 9, Q06O08, doi:10.1029/2007GC001760.

2007

- Alt, J.C., W.C. Shanks, III, W. Bach, H. Paulick, C. J. Garrido, and G. Beaudoin' 2007. Hydrothermal Alteration and Microbial Sulfate Reduction in Peridotite and Gabbro Exposed by Detachment Faulting at the Mid-Atlantic Ridge, 15°20'N (ODP Leg 209): A Sulfur and Oxygen Isotope Study. *Geochem. Geophys. Geosyst.*, v 8 no.8; Q08002, doi:10.1029/2007GC001617
- Alt, J.C., D.A.H. Teagle, S. Umino, S. Miyashita, N.R. Banerjee, D.S. Wilson, IODP Expeditions 309 and 312 Scientists, and the ODP Leg 206 Scientific Party, 2007. IODP Expeditions 309 and 312 Drill an Intact Section of Upper Oceanic Basement into Gabbros, *Scientific Drilling*, 4, 4-10.

W.C. Shanks, III, J. C. Alt, and L.A. Morgan, 2007. Geochemistry of Sublacustrine Hydrothermal Deposits in Yellowstone Lake—Hydrothermal Reactions, Stable Isotope Systematics, Sinter Deposition, and Spire Formation, in: Integrated Geoscience Studies in the Greater Yellowstone Area— Volcanic, Tectonic, and Hydrothermal Processes in the Yellowstone Geocosystem , L. A. Morgan, ed., U.S. Geological Survey Professional Paper 1717, 205-234.

2006

Alt, J.C. and W. Bach, 2006. The Oxygen Isotope Composition of a Section of Lower Oceanic Crust, ODP Hole 735B. *Geochem. Geophys. Geosyst.*, 7, no, 12, Q12008, doi:10.1029/2006GC001385

Alt, J.C. and W.C. Shanks, 2006. Stable isotope compositions of serpentinite seamounts in the Mariana Forearc: Serpentinization processes, fluid sources and sulfur metasomatism, *Earth. Planet. Sci. Lett.*, 242, 272–28

Alt, J.C. and C.Laverne, 2006. Chemical compositions of secondary minerals from Site 1256 basement, ODP Leg 206. *Proc. ODP, Sci. Results, 206*. http://www-odp.tamu.edu/publications/206_SR/003/003.htm

Laverne, C., O. Grauby, J. C. Alt, and M. Bohn (2006), Hydroschorlomite in altered basalts from Hole 1256D, ODP Leg 206: The transition from low-temperature to hydrothermal alteration, *Geochem. Geophys. Geosyst.*, 7, Q10003, doi:10.1029/2005GC001180.

Nielsen, S.G., M. Rehkämper, D.A.H. Teagle, D.A. Butterfield, J.C. Alt and A.N. Halliday, 2006, Hydrothermal fluid fluxes calculated from the isotopic mass balance of thallium in the ocean crust, *Earth. Planet. Sci. Lett.*, 251, 120-133

Wilson. D., D.A.H. Teagle, J.C. Alt, N.R. Banerjee, S. Umino, S. Miyashita, G.D. Acton, R. Anma, S.R. Barr, A. Belghoul, J. Carlut, D.M. Christie, R.M. Coggon, K.M. Cooper, C. Cordier, L. Crispini, S.R. Durand, F. Einaudi, L. Galli, Y. Gao, J. Geldmacher, L.A. Gilbert, N.W. Hayman, E. Herrero-Bervera, N. Hirano, S. Holter, S. Ingle, S. Jiang, U. Kalberkamp, M. Kerneklia, J. Koepke, C. Laverne, H.L. Lledo Vasquez, J. MacLennan, S. Morgan, N. Neo, H.J. Nichols, S.H. Park, M.K. Reichow, T. Sakuyama, T. Sano, R. Sandwell, B. Scheibner, C.E. Smith-Duque, S.A. Swift, P. Tartarotti, A.A. Tikku, M. Tominaga, E.A. Veloso, T. Yamasaki, S. Yamazaki, C. Ziegler, 2006. Drilling to gabbro in intact ocean crust. *Science*, 312, 1016-1020.

Tartarotti P., Crispini L., and the IODP Expeditions 309 and 312 Shipboard Scientific Parties, 2006. ODP-IODP Site 1256 (East Pacific Rise): An In-Situ section of Upper Ocean Crust formed at a Superfast Spreading Rate, *Ofioliti* , 31 (2), 107-116, 2006

Shanks, W.C., III, Alt, J., and Morgan, L.A., 2006, Geochemistry of sublacustrine hydrothermal deposits in Yellowstone Lake: Hydrothermal reactions, stable isotope systematics, sinter deposition, and spire growth, *in* Morgan, L.A., ed., Integrated Geoscience Studies in the Greater Yellowstone Area: Volcanic, Hydrothermal and Tectonic Processes in the Yellowstone Geocosystem, U.S. Geological Survey Professional Paper 1717.

2005

Alt, J.C., Miyashita, S., Teagle, D.A.H, Umino, S., Miller, D.J., and the Expeditions 309 and 312 Project Team, 2005. Superfast Spreading Rate Crust 2 and 3. *IODP Sci. Prosp.*, 309/313.

<http://iodp.tamu.edu/publications/SP/309313SP/309313SP.PDF>.

Shanks, W.C., III, Morgan, L.A., Balistrieri, L., and Alt, J., 2005, Hydrothermal vent fluids, siliceous hydrothermal deposits, and hydrothermally altered sediments in Yellowstone Lake, in Inskip, W., and McDermott, T. ed., *Geothermal Biology and Geochemistry in Yellowstone park*, Thermal Biology Institute, Montana State Univ. Bozeman, p. 53-72.

2004

Alt, J.C., Alteration of the Upper Oceanic Crust: Mineralogy, Chemistry, and Processes, in: Elderfield, H. and Davis, E., eds, *Hydrogeology of the Oceanic Lithosphere*, Cambridge University Press, New York, 456-488.

Teagle, D.A.H. and J.C. Alt, 2004. Hydrothermal alteration of basalts beneath the Bent Hill massive sulfide deposit, Middle Valley, Juan de Fuca Ridge, *Econ. Geol.*, 99, 561-584.

2003

Alt, J. C., Stable isotopic composition of upper oceanic crust formed at a fast spreading ridge, ODP Site 801, *Geochem. Geophys. Geosyst.*, 4(5), 8908, doi:10.1029/2002GC000400.

Alt, J.C., Hydrothermal Fluxes At Mid-Ocean Ridges And On Ridge Flanks, *Comptes Rendus Geoscience*, 335, 853-864.

Alt, J.C. and W.C. Shanks, Serpentinization of abyssal peridotites from the MARK area, Mid-Atlantic Ridge: Sulfur geochemistry and reaction modeling, *Geochim. Cosmochim. Acta*, 67, 641-653.

Alt, J.C., and D.A.H. Teagle, Hydrothermal Alteration of Upper Oceanic Crust Formed at a Fast Spreading Ridge: Mineral, Chemical, and Isotopic Evidence from ODP Site 801. *Chem Geol*, 201, 191-211.

Alt, J.C. and W. Bach, Alteration of Oceanic Crust: Subsurface Rock-Water Interactions, in: Energy and mass transfer in marine hydrothermal systems, P.E. Halbach, V. Tunnicliffe, and J.R. Hein, eds., Dahlem University Press, 7-27.

Alt, J.C., Davidson, G.J., Teagle, D.A.H., and Karson, J.A., The Isotopic Composition of Gypsum in the Macquarie Island Ophiolite: Implications for the Sulfur Cycle and the Subsurface Biosphere in Oceanic Crust, *Geology*, 31: 549-552;

Devey, C.W., J.C. Alt, W. Bach, J. Erzinger, A.T. Fisher, K.M. Gillis, M. Kinoshita, P. Nehlig, H. Staudigel, 2002. What Is the Nature of Sub-seafloor Fluid Circulation and Reaction Processes? in: Energy and mass transfer in marine hydrothermal systems, P.E. Halbach, V. Tunnicliffe, and J.R. Hein, eds., Dahlem University Press, 71-84.

Kesler, S.E., Fortuna, J., Alt, J.C., Ye, Z., Core, D.P., Zohar, P., Borhauer, J., and Chryssoulis, S.L., Evaluation of the role of sulfidation in deposition of gold, Screamer section of the Betze-Post Carlin-Type gold deposit, Nevada, *Econ. Geol.* 98, 1137-1157.

Teagle, D.A.H., M.J. Bickle, and J.C. Alt, 2003. Recharge flux to ocean-ridge black smoker systems: a geochemical estimate from ODP Hole 504B Earth Planet. Sci. Lett. 210, 81-89

2002

Chan, Lui-Heung, J.C. Alt, and D.A.H. Teagle, Lithium and lithium isotope profiles through the upper oceanic crust: A study of seawater basalt exchange at ODP Sites 504b and 896A. *Earth Planet. Sci. Lett.*, 201, 187-201.

2001

Alt, J.C. and W. Bach, Low Grade Hydrothermal Alteration Of Uplifted Lower Oceanic Crust, Hole 735B: Mineralogy And Isotope Geochemistry. Proc. OCP, Sci. Results, 176, Ocean Drilling Program, College Station, TX, http://www-odp.tamu.edu/publications/176_SR/

Alt, J.C. and D.A.H. Teagle, 2000. Hydrothermal alteration and fluid fluxes in ophiolites and oceanic crust, in: Dilek, Y., E. Moores, and D. Elthon and A. Nicolas, eds., *Geol. Soc. Am. Spec. Paper 349, Ophiolites and Oceanic Crust: New Insights from Field Studies and Ocean Drilling Program*, 273-282.

Bach, W. Alt, J.C., Niu, Y., Humphris, S.E., Erzinger, J., and Dick, H.J.B., The chemical consequences of late-stage hydrothermal circulation in an uplifted block of lower ocean crust at the SW Indian Ridge: Results from ODP Hole 735B (Leg 176). *Geochimica et Cosmochimica Acta*, 65: 3267-3287.

Blake, R.E., Alt, J.C. and Martini, A.M., Oxygen isotope ratios of PO₄: An inorganic indicator of enzymatic activity and P metabolism and a new biomarker in the search for life. *Proc. Nat. Acad. Sci.* 98: 2148-2153.

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Zhou, W., D.R. Peacor, J. Alt, R. Van der Voo, L.-S. Kao. TEM Study of the Alteration of Glass in MORB by Inorganic Processes. *Chem. Geol.* 174, 365-376.

2000

Alt, J.C. and P. Mata, 2000. On the role of microbes in the alteration of submarine basaltic glass: a TEM study. *Earth Planet. Sci. Lett.*, 181, 301-313.

Yi, W., A.N. Halliday, J. Alt, D.C. Lee, M. Rehkamper, M. Garcia, C. Langmuir, and Y. Su. Cadmium, indium, tin, tellurium, and sulfur in oceanic basalts: Implications for chalcophile element fractionation in the mantle. *J. Geophys. Res.*, 105, 18,927-18,948.

Dick, H.J.B., J. Natland, J. Alt, W. Bach, D. Bideau, J. Gee, S. Haggas, J. Hertogen, G. Hirth, P. Holm, B. Ildefonse, G. Iturrino, B. John, D. Kelley, E. Kikawa, A. Kingdon, P. LeRoux, J. Maeda, P. Meyer, D.J. Miller, H.R. Naslund, Y.L. Niu, P. Robinson, J. Snow, R. Stephen, P. Trimby, H.U. Worm, A. Yoshinobu. A long in-situ section of the lower ocean crust: Results of ODP Leg 176 drilling at the southwest Indian Ridge. *Earth Planet. Sci. Lett.* 179, 31-51.

D.A.H. Teagle, M.J. Bickle, and J.C. Alt, High Temperature Mid-ocean Ridge Hydrothermal Flux Estimates from Sr-transport Modeling of Fluid-rock Exchange in Hole 504B, (extended abstract) Goldschmidt conference *Journal of Conference Abstracts Volume 5(2)*, 987, Cambridge Publications, Oxford, UK.

Smith, Spivack, Fisk, Haveman, Staudigel, and Shipboard Scientific Party. Methods for quantifying microbial contamination during deep ocean coring, ODP Technical Note 28, <http://www-odp.tamu.edu/publications/tnotes/tn28/index.htm>

1999

Alt, J.C., Hydrothermal alteration of the oceanic crust: Mineralogy, geochemistry and processes. In: Volcanic Associated Massive Sulfide Deposits, Reviews In Economic Geology, vol. 8, Barrie, T., and Hannington, M. eds., Soc. Econ. Geol. Chelsea, MI, 133-155.

Alt, J.C., Very Low Grade Hydrothermal Metamorphism of Basic Igneous Rocks. In: Very Low Grade Metamorphism. M. Frey and D. Robinson, eds., Blackwell Scientific, pp. 169-201.

Alt, J.C. and D.A. H. Teagle. Uptake of carbon during alteration of oceanic crust. *Geochim. Cosmochim. Acta*, 63, 1527-1535.

Rehkamper, M. A.N. Halliday, J. Alt, J.G. Fitton, J. Zipfel, and E. Takazawa, Non-Chondritic Platinum-Group Element Ratios in Abyssal Peridotites: Petrogenetic Signature of Melt Percolation?, *Earth Planet. Sci. Lett.*, 172, 65-81.

Teagle, D.A.H. and J.C. Alt, Alteration and vein log of ODP Holes 917A and 918D, SE Greenland Margin, In Duncan, R.A. H.C. Larsen, J.F. Allan eds., *Proc. ODP Sci. Results*, 163.

1998

Alt, J.C. and W.C. Shanks, Sulfur in serpentinized oceanic peridotites: Serpentinization processes and microbial sulfate reduction, *J. Geophys. Res.*, 103, 9917-9929.

Alt, J.C., D.A.H. Teagle, T.S. Brewer, W.C. Shanks, and A.N. Halliday, Alteration and mineralization of an oceanic forearc and the ophiolite-ocean crust analogy, *J. Geophys. Res.*, 103, 12,365-12,380.

Teagle, D.A.H., J.C. Alt, and A.N. Halliday, Tracing the chemical evolution of fluids during hydrothermal recharge: Constraints from anhydrite recovered in ODP Hole 504B, *Earth Planet. Sci. Lett.*, 155, 167-182.

Teagle, D.A.H., J.C. Alt, H. Chiba, S. Humphris, and A.N. Halliday. Strontium and oxygen isotopic constraints on fluid mixing, alteration and mineralization in the TAG hydrothermal deposit. *Chem. Geol.* 149, 1-24

Teagle, D.A.H., J.C. Alt and A.N. Halliday. Tracing the evolution of hydrothermal fluids in the upper oceanic crust: Sr isotopic constraints from DSDP/ODP Holes 504B and 896A, in: *Modern Ocean-Floor Processes and the Geological Record*, R.A. Mills and K. Harrison, eds, *Geol. Soc. Lond. Spec. Pub.* 148, pp. 81-97.

1997

Alt, J.C., and Teagle, D.A.H., Probing the TAG hydrothermal mound and stockwork: Oxygen isotopic profiles from deep ocean drilling. In: Humphris, S.E., Herzig, P.M., Miller, D.J., Zierenberg, R. (Eds.), *Proc. ODP, Sci. Results*, 158: College Station, TX (Ocean Drilling Program), 285-294.

Honnorez, J.C. Alt, and S. Humphris. Vivisection and autopsy of active and fossil hydrothermal alterations of basalt beneath and within the TAG hydrothermal mound. In: Humphris, S.E.,

Herzig, P.M., Miller, D.J., Zierenberg, R. (Eds.), Proc. ODP, Sci. Results, 158: College Station, TX (Ocean Drilling Program), 231-254.

Humphris, S.E., J.C. Alt, D.A.H. Teagle, and J. Honnorez. Geochemical changes during hydrothermal alteration of basement in the stockwork beneath the active TAG Hydrothermal mound. In: Humphris, S.E., Herzig, P.M., Miller, D.J., Zierenberg, R. (Eds.), Proc. ODP, Sci. Results, 158: College Station, TX (Ocean Drilling Program), 255-276.

Teagle, D.A.H., J.C. Alt, S.H. Humphris and A.N. Halliday. Dissecting an active hydrothermal deposit: The strontium and oxygen isotopic anatomy of the TAG hydrothermal mound - whole rock and silicate minerals. In: Humphris, S.E., Herzig, P.M., Miller, D.J., Zierenberg, R. (Eds.), Proc. ODP, Sci. Results, 158: College Station, TX (Ocean Drilling Program), 297-312.

Teagle, D.A.H., J.C. Alt, H. Chiba, and A.N. Halliday. Dissecting an active hydrothermal deposit: The strontium and oxygen isotopic anatomy of the TAG hydrothermal mound - Anhydrite. In: Humphris, S.E., Herzig, P.M., Miller, D.J., Zierenberg, R. (Eds.), Proc. ODP, Sci. Results, 158: College Station, TX (Ocean Drilling Program), 129-142.

1996

Alt, J.C., D.A.H. Teagle, C. Laverne, D. Vanko, W. Bach, J. Honnorez, K. Becker, M. Ayadi, and P.A. Pezard. Ridge flank alteration of upper ocean crust in the eastern Pacific: A synthesis of results for volcanic rocks of holes 504B and 896A. In: Alt, J.C., Kinoshita, H., Stokking, L.B., and Michael, P., J. (Eds.), Proc. ODP, Sci. Results, 148: College Station, TX (Ocean Drilling Program), 435-452).

Alt, J.C., C. Laverne, D. Vanko, P. Tartarotti, D.A.H. Teagle, W. Bach, E. Zuleger, J. Erzinger, J. Honnorez, P.A. Pezard, K. Becker, M. H. Salisbury, and R.H. Wilkens. Hydrothermal alteration of a section of upper oceanic crust in the eastern equatorial Pacific: A synthesis of results from Site 504 (DSDP legs 69, 70, and 83, and ODP legs 111, 137, 140, and 148). In: Alt, J.C., Kinoshita, H., Stokking, L., and Michael, P., et al., Proc. ODP, Sci. Results, 148: College Station, TX (Ocean Drilling Program), 417-434.

Alt, J.C., D.A.H. Teagle, W. Bach, A.N. Halliday, and J. Erzinger. Stable and strontium isotopic profiles through hydrothermally altered upper oceanic crust, ODP Hole 504B. In Alt, J.C., Kinoshita, H., Stokking, L., and Michael, P., Proc. ODP, Sci. Results, 148, College Station, TX (Ocean Drilling Program), 47-70.

Bach, W., J. Erzinger, J. Alt, and D. Teagle. Chemistry of the lower sheeted dike complex, ODP Hole 504B: The influence of magmatic differentiation and hydrothermal alteration. In Alt, J.C., Kinoshita, H., Stokking, L., and Michael, P., Proc. ODP, Sci. Results, 148, College Station, TX (Ocean Drilling Program), 39-56.

Mills, R. A., T. Clayton and J.C. Alt. Low-temperature fluid flow through sulfidic sediments from TAG: modification of fluid chemistry and alteration of mineral deposits. Geophys. Res. Lett., 23: 3495-3498.

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Vanko, D.A., C. Laverne, P. Tartarotti, and J. C. Alt. Chemistry and origin of secondary minerals from the deep sheeted dikes cored during ODP Leg 148, Hole 504B. In Alt, J.C., Kinoshita, H., Stokking, L., and Michael, P., Proc. ODP, Sci. Results, 148, College Station, TX (Ocean Drilling Program), 71086.

Zuleger, E., J.C. Alt and J. Erzinger. Trace element geochemistry of the lower sheeted dike complex: Hole 504B, Leg 140. In Alt, J.C., Kinoshita, H., Stokking, L., and Michael, P., Proc. ODP, Sci. Results, 148, College Station, TX (Ocean Drilling Program), 455-466.

1995

Alt, J.C. Subseafloor processes in mid-ocean ridge hydrothermal systems. In: Humphris, S., J. Lupton, L. Mullineaux, and R. Zierenberg, eds., Seafloor hydrothermal Systems: , Physical, Chemical, and Biological Interactions, Geophys. Monogr. 91, AGU, Wash. DC; 85-114.

Alt, J.C. Sulfur Isotopic Profile through the Oceanic Crust: Sulfur mobility and seawater-crustal sulfur exchange during hydrothermal alteration. *Geology*, 23: 585-588.

Humphris, S.H., P.M. Herzig, D.J. Miller, J.C. Alt, et al., The internal structure of an active seafloor massive sulfide deposit, *Nature*, 377: 713-716.

Kadko, D., J. Baross, and J.C. Alt. Hydrothermal fluxes and global change. In: Humphris, S., J. Lupton, L. Mullineaux, and R. Zierenberg, eds., Seafloor Hydrothermal Systems: , Physical, Chemical, and Biological Interactions, Geophys. Monogr. 91, AGU, Wash. DC; 446-466.

Alt, J.C., Zuleger, E., and Erzinger, J. Stable isotopic compositions of hydrothermally altered lower sheeted dikes, ODP Hole 504B, Leg 140. In: Dick, Erzinger, Stokking et al., Proc. ODP, Scientific Results, V. 140; 155-166.

Appold, M., Kesler, S., and Alt, J. Geochemical constraints on the genesis of Mississippi Valley-type mineralization in the central Appalachians, *Econ. Geol.*90: 902-919.

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