VITAE of HIROSHI OHMOTO

***Current Positions***

EmeritusProfessor of Geochemistry, Department of Geosciences, College of Earth and Mineral Sciences, The Pennsylvania State University.

 Emeritus Professor of Geochemistry and Resource Geology, College of Science, Tohoku University, Sendai, Japan

***Education/Degrees***

 B.S. in Geology, Hokkaido University, 1964.

 A.M. in Geology, Princeton University, 1967.

 Ph.D. in Geology, Princeton University, 1969.

**Appointments**

 Princeton University, Princeton, New Jersey

 Research Assistant, 9/64 - 8/68.

 Research Associate, 9/68 - 10/68.

 The University of Alberta, Edmonton, Alberta, Canada

 Killam Research Fellow, 11/68 - 8/70.

 Lecturer of Geochemistry, 9/69 - 10/70.

 The Pennsylvania State University, University Park, Pennsylvania

 Assistant Professor of Geochemistry, 11/70 - 6/74.

 Associate Professor of Geochemistry, 7/74 - 6/78.

 Professor of Geochemistry, 7/78 – 6/2014

 Director, Ore Deposit Research Section, 12/96 – 10/09.

 Director, Astrobiology Research Center, 7/98 – 10/09.

 Tohoku University, Sendai, Japan

 Professor of Geochemistry and Director of Research Center for Natural Resources and Environmental Geochemistry, 6/87 - 3/98.

 University of Tokyo, Tokyo, Japan

 Professor of Geochemistry, 10/93 - 3/95.

##### Courses Taught at PSU (last 5 yrs only)

* GSc. 416 Introduction to isotopes in geosciences (3 credits): Given in every Spring semesters.
* GSc. 451 Natural resources: origins, uses, and environmental impacts (3 credits; Fall semesters): Given in every Fall semesters.
* Astrobiology 590/GSc. 597 Advancements in Astrobiology (2 credits).
* Astrobiology 570 Astrobiology Field Course (2 credits).
* Gsc. 600 and 601. Thesis research (1-6 credits).

##### Senior theses supervised at PSU: 8

### Graduate Students Supervised

 *Ph. D. Theses Supervised at Penn State* *(Year Degree Received)***: 23**

 T. Casadevall (1976), E.M. Ripley (1976), R.K. McLimans (1977), D.L. Shettel (1977), D.R. Cole (1980), S.E. Drummond (1981), V. Pisutha-Arnond (1982), D. Wesolowski (1984), C.S. Eldridge (1984), T.V. Segalstad (1988), L. Hoy (1989), C.J. Kaiser (1988), K.A. Geer (1988), U. Graham (1991), S. Poulson (1991), W. Albrecht (1992), T. Kakegawa (1997), S. Ono (2001), K. Yamaguchi (2002), Y. Watanabe (2002), T. Otake (2008), I. Johnson (2014\*), J. Brainard (2014\*).

 \* Unfinished

 *Ph. D. Theses Supervised (Students from Other Institutions Who Conducted Parts of Their Thesis Research at Penn State)*: **7**

 R.J. Allmandinger (New Mexico Inst. of Technology, 1975), R.J. Kamilli (Harvard, 1979), D.J. Patterson (Univ. of Tasmania, 1979), M. Mizukami (Univ. of Tokyo, 1982), P. Torssander (Univ. of Stockholm, 1985), J. Coipel (Univ. of Liege, 1989), U. Jakobsen (Univ. of Copenhagen, 1992).

 *Master's Theses Supervised (PSU Students)***: 22**

 T. Casadevall (1973), J.F. Whelan (1974), J.R. Bahr (1976), K.M. Krupka (1976), T.A. Drean (1978), V. Pisutha-Arnond (1978), S.S. Howe (1981), C.S. Eldridge (1981), T. Lenagh (1984), A. Pavelka (1984), W. Kubilius (1984), E. Mikucki, Jr. (1986), G.J. Bluth (1987), T. Kakegawa (1993), R. Mock (1997), E. Bazilveskaya (2004), D. Bevacqua (2007), I. Johnson (2009), H. Hamasaki (2011), W. Ethier (2014\*), A. Chorney (2014), S. Kurdick (2015\*).

 *Ph.D. Theses Supervised at Tohoku University***: 9**

 K. Hayashi (1989), Y. Liu (1996), M. Ohtake (1997), H. Sato (1997), X. Chu (1997), M. Manaka (1998), X. Chu (1997), A. Samieyani (1998), M. Haruna (2005).

 *Master's Theses Supervised at Tohoku University***:21**

 M. Yokoyama (1988), M. Haruna (1989), Y. Kajisa (1990), T. Saito (1990), H. Yamaguchi (1991), K. Morimoto (1992), J. Kabamoto (1992), R. Murata (1993), T. Hanamuro (1994), K. Uyeda (1994), M. Ohtake (1994), N. Kassai (1995), M. Manaka (1995), A. Samieyani (1995), Y. Iwata (1996), Y. Watanabe (1997), K. Kumazawa (1997), T. Omata (1997), S. Ogino (1998), T. Shibasaki (1998), T. Yoshida (1998)

 ***Post-doctoral Fellows and Research Associates Supervised***: **15**

 M. Mizukami (1978-79), G.R. Green (1979-82), M. Tsutsumi (1982-83), X.L. Chu (1985-89), F. Gauthier-Lafaye (1986-87), M. Nedachi (1992-93), Y. Nedachi (1993-94), G. Kamei (1995-96), Naoki Watanabe (1998 – 99; 2001-02), Michael Bau (1999 – 2002), Shuhei Ono (2001 – 02), Akiko Uchida (2002), Hiroaki Ikemi (2002 - 2003), Efem Altinok (2005 – 2007), Yumiko Watanabe (2002 – 2013).

***Research Assistants and Technicians (Full time) Supervised*: 5**

 M. Michlick (1987 – 89), Dennis Walizer (1989 – 2014), Kate Spangler (2001 – 2004), J. Rimmer (2003 - 2004), Alice Clark (2004 – 2006).

 ***Administrative Assistant Supervised***

 L. Decker (1998 – 2006), L. Altamura (2006 – 2009)**: 2**

***Services to PSU*** *(last 5 years only)*

Director, Penn State Astrobiology Research Center, 1998 – 2009.

Life Science Consortium; EMS College’s representative to the Steering Committee, 1998 - 2006.

Associate Dean Search Committee, College of Earth & Mineral Sciences (member), 2003.

Faculty Search Committee for faculty hire in Astrobiology/Geosciences (Chair), 1999, 2004.

***Editorial Board***

 Chemical Geology, Associate Editor (1984 - 2002).

 Resource Geology, Associate Editor (1986 - 2013).

 Geochimica et Cosmochimica Acta, Associate Editor (1994 - 2002).

 Astrobiology, Associate Editor (2001 - 2014).

***Professional Societies and Committee Memberships***

 Geochemical Society

 Nominating Committee, 1977 - 79

 Clark Medal Committee, 1977 - 79 (Chairman, 78 - 79)

 Society of Economic Geologists

 Lindgren Award Committee, 1979 - 82 (Chairman, 80- 82)

 Research Committee, 1985 - 88 (Chairman, 86 - 88)

 Distinguished Lecture Committee, 1986 - 88 (Chairman, 86 - 88)

 Program Policy Committee, 1986 - 88.

 American Geophysical Union

 Society of Resource Geology, Japan

 Councilor, 1988 - 1998.

 Society of Petrology, Mineralogy and Economic Geology, Japan

 Councilor, 1988 - 1998.

 Geochemical Society of Japan.

 Geological Society of America

 NASA Astrobiology Institute

 Executive Councilor, 1998 - 2009.

 The Astrobiology Society

 Founding member, 2007 – 2014.

***Honor Societies, Memberships***

 The Obelisk Society, College of Earth and Mineral Sciences, Penn State Univ. (1991 - present).

 The President Club, Penn State Univ. (1991 - present).

 The Mount Nittany Society, Penn State Univ. (1995 - present).

***Research Interests***

 Astrobiology: Chemical and biological evolution of the early Earth through geochemical studies of paleosols, shales, uraniferous conglomerates, red beds, banded iron formations, cherts, carbonates. Origin of life and evolution. Asteroids and the origin of Earth and the Moon.

 Geochemistry of hydrothermal systems and the origins of ore deposits: submarine and subaerial hydrothermal systems, volcanogenic massive sulfides, banded iron formations, shale/carbonate-hosted massive sulfides, Mississippi Valley-type base metal deposits, gold and basemetal veins, skarns.

 Stable isotope geochemistry of sulfur, carbon, oxygen, and hydrogen in geological systems.

***Professional Awards***

 Waldermar Lindgren Citation for Excellence in Research, 1970, Society of Economic Geologists.

 Frank Wigglesworth Clarke Medal, 1973, Geochemical Society.

 Faculty Scholar Medal for Outstanding Achievement in Science and Technology, 1981, The Pennsylvania State University.

 Silver Medal, 1994, Society of Economic Geologists.

 Wilson Award for Excellent in Research, 2001, College of Earth and Mineral Sciences, Penn State University.

 The Kato Medal, 2009, Society of Resources Geology.

 The Shibata Medal, 2014, Geochemical Society of Japan

***Other Professional Awards and Honors***

 Fulbright Graduate Fellowship, 1964-1969.

 Killam Post Doctoral Fellowship, University of Alberta, 1968-70.

 The Japan Society for Promotion of Science, Senior Fellow, 1976-77.

 The United States Geological Survey Lecturer, Short Course on "Ore Genesis and Isotope Geochemistry", Denver, 1977.

 Canadian Institute of Mining and Engineering Lecturer, lecture tour of five Canadian universities, 1978.

 The U.S.-Japan-Canada Cooperative Research Project on the Genesis of Volcanogenic Massive Sulfide Deposits, Director, 1978-1983.

 Gordon Research Conference on Inorganic Geochemistry, Chairman, 1981.

 Alexander von Humboldt Stiftung, Fellow, Univ. of Göetingen, Germany, 2//82 - 8/82.

 Centre National de la Recherches Scientifique, and Centre de Recherches sur la Géologie de l'Uranium, France, Visiting Professor, 2/84 - 8/84.

 The Nordic Research Council Lecturer, Short course on "Isotope Geochemistry of Ore Deposits", Oslo, Norway, 1986.

 The Mineralogical Society of America, Lecturer, Short course on " Stable Isotopes in High Temperature Geological Processes", San Antonio, Texas, 1986.

 The Nordic Research Council, Lecturer, Lecture tour of Danish institutions, 1987.

 Canadian Institute of Mining and Metallurgy Lecturer, Short Course on “Sediment hosted basemetal deposits”, Brisbane, Australia, 1993.

 Adjunct Professor at Japanese National Universities:

 Hokkaido University, 4/88 - 3/89; 4/96 - 3/97

 Ibaraki University, 4/91-3/92

 Hiroshima University, 4/91 - 3/92

 Kyoto University, 4/91- 3/92

 Kumamoto University, 4/92 - 3/93

 Akita University, 4/92 - 3/93

 Yamagata University, 4/92 - 3/93

 Niigata University, 4/95 - 3/96

 Chiba University, 4/95 - 3/96

 Yamaguchi University, 4/96 - 3/97

 Kagoshima University, 4/96 - 3/97

 Tsukuba University, 4/97 - 3/98

 The Research Council of Japan, member, 4/88 - 3/98

 Advisor, Geosciences and Environmental Sciences departments, Washington State Univ., 2001.

 Served as one of two members to evaluate two departments (Geosciens and Environmental Sciences) of the Washington, State Univeristy, 2001.

Director, international research project on “Origins of banded iron formations”, funded from the Japanese Ministry of Education and NASA Astrobiology Institute, 1989 – present.

Coordinator of the Archean Biosphere Drilling Project, a new initiative by the NASA Astrobiology Institute, the Australian Geological Survey, the University of Western Australia, and the Japanese Ministry of Education, 2002 – present.

***Convener of Scientific Conferences***

 Workshop on "Research Frontiers in Exploration of Non-Renewable Resources" (with A.R. Rose, H.L. Barnes, and C.W. Burnham; sponsored by NSF), The Pennsylvania State University, 1976.

 International Conference on "The Genesis of Volcanogenic Massive Sulfide Deposits" ; sponsored by NSF and JSPS, Tokyo, 1978.

 Symposium on "New Exploration Guides for Kuroko-type Massive Sulfide Deposits"; sponsored by the Geol. Association and the Mineralogical Society of Canada), Calgary, 1981.

 Gordon Research Conference on "Geochemistry of Ore Deposits" (with M.T. Einaudi), Colby-Sawer College, New Hampshire, 1981.

 Symposium on "Massive Sulfides Associated with Submarine Volcanism" (sponsored by the Society of Economic Geologists), Geol. Soc. of America Ann. Mtgs., New Orleans, 1982.

 Symposium on "Geochemistry of Ore Deposits" at the Fourth International Conference on Water-Rock Interaction, Misasa, Japan, 1983.

 Symposium on "The Genesis of Low Temperature Ore Deposits" at the Sixth International Conference on Geochronology, Cosmochronology and Isotope Geology, Cambridge, England, 1986.

 NATO Advanced Institute on "Geochemistry of Hydrothermal Ore-Forming Processes" (with H.L. Barnes, B. Potty, A. Arribas, and S.M.F. Sheppard; sponsored by NATO), Salamanca, Spain, 1987.

 American Geophysical Union, Western Pacific Geophysics Meetings, Kanazawa City, Japan, August, 1990 (Program chairman for Volcanology, Geochemistry and Petrology Section).

 International Geological Congress, 1992, Organization Committee, Program Executive Committee, 1989-92.

 Symposium in honor of H.D. Holland, Goldschmidt Conference, Reston, 1992.

 Astrobiology Conference, Program Committee, Washington, D.C., 2001.

 Pardee Symposium, “Early evolution of the atmosphere, hydrosphere, and oceans: Constraints from ore deposits”, Convener, sponsored by the Geological Society of America, Geochemical Society, Society of Economic Geologists, and NASA Astrobiology Institute, Denver, 2002.

 NSF Workshop on “Research Opportunities in Geology and Geochemistry of Mineral Deposit Systems”, Convener, Denver, 2002.

 Astrobiology Drilling Session at the Astrobiology Science Conference 2004, NASA Ames, 2004.

 Astrobiology Drilling Session at the American Geophysical Union, San Francisco, 2004.

NASA Field Workshop on “Biosignatures in Ancient Rocks”, Ontario, Canada, 2007.

American Geophysical Union, Union Session “Oxygenation of the Earth”, San Francisco, 2012.

The Holland Symposium, Goldschmidt Conference, Florence, 2013.

***Keynote Lectures at National and International Conferences***

 Annual Meeting of the Society of Mining Geologists, Tokyo, Japan, 1977.

 Fourth-International Conference on Water-Rock Interaction, Misasa, Japan, 1983.

 Conference on Tectonic Control of Ore Deposits, Princeton, 1984.

 International Conference on Recent Advances in Geochemistry of Ore Deposits, Montreal, Canada, 1984.

 International Conference on Stable Isotopes and Fluid Processes, Brisbane, Australia, 1985.

 NATO Advanced Study Institute on Geochemistry of Hydrothermal Ore Deposits, Salamanca,Spain, 1987.

 Symposium on “Future of Mineral Resources and Economic Geology”, Japanese National Academy of Science, Tokyo, Japan, 1988.

 Annual Meeting of the Society of Petrology, Mineralogy , and Economic Geology, Sendai, Japan, 1988.

 International Geological Congress, Kyoto, Japan, 1992.

 Australian Geological Convention, Perth, Australia, 1994.

 International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere, Sendai, Japan, 1997.

 Annual Meeting of the Geological Society of Namibia, Windhoek, Namibia, 1998.

 Annual Meeting of the Geological Society of South Africa, 1998.

 Conference on “Bridging the Two Worlds, Archean and Proterozoic”, UCLA, 1999.

 50th Anniversary of the Society of Resource Geology, Tokyo, 2001.

 Gordon Conference on “Geochemistry of Hydrothermal Ore Deposits”, Plymouth, NH, 2001.

 Fourth International Archean Symposium, Perth, Australia, 2001.

 Pardee Symposium, Geological Society of America, Denver, 2002.

 International Workshop on Underground Waste Disposal, Tokai, Japan, 2003.

 Fermor Lecturer at the Geological Society’s 2003 Fermor Flagship Meeting, “World Class Mineral Deposits and Earth Evolution”, Cardiff, Wales, 2003.

 Gast Lecturer, the Goldschmidt Conference, Kurashiki, Japan, 2003.

 NASA Astrobiology Institute Biannual Meeting, Boulder, 2005.

 The Geological Society of America, Salt Lake City, 2005.

 Pilbara Workshop, Perth, Australia, 2005.

 Astrobiology Science Conference, Washington, D.C., 2006.

 Bioastronomy 2007, Puerto Rico, 2007.

 The Australian Earth Sciences Convention 2008, Perth, Australia.

 Ann. Mtg. of the Society of Resource Geology, Tokyo, Japan, 2009.

 American Geophysical Union, 2012/

***Funded Research Projects***

 Sulfur isotopic equilibria in hydrothermal systems;

 National Science Foundation, GA-31901, 1/72 - 6/74, $30,600. PI.

 Stable isotopes in hydrothermal systems;

 National Science Foundation, GA-31901A, 1/74 - 6/76, $51,200. PI.

 Geochemistry of cupriferous sulfide deposits at Raul mine, Peru;

 Cia Minera Pativilca, S.A., Lima, Peru, 1/75 - 6/76, $11,378. PI.

 Experimental evaluation of geochemical conditions in geothermal energy systems; National Science Foundation, AER-74-08473, 3/75 - 8/77, $402,040. Co-PI. (with H.L. Barnes and C.W. Burnham)

 Field conference on the Kuroko deposits;

 National Science Foundation, EAR-7817167, 6/78 - 12/79, $29,953. PI.

 Stable isotopes in hydrothermal systems;

 National Science Foundation, EAR-76-03724, 4/76 - 9/80, $174,400. PI.

 Genesis of volcanogenic massive sulfide deposits;

 National Science Foundation, INT-79-06779, 5/79 - 10/81, $21,561. PI.

 The U.S.-Japan-Canada cooperative research project on the genesis of volcanogenic massive sulfide deposits (Project leader); National Science Foundation, EAR-78-17738, 8/78 - 1/82, $533,450. PI.

 The U.S.-Japan-Canada cooperative research project on the genesis of volcanogenic massive sulfide deposits (Project leader); National Science Foundation, EAR-81-09270, 8/81 - 1/83, $224,200. PI.

 Geochemistry of molybdenum-quartz veins at Ord Mountain Prospect, California;

 Patino Management Service, 8/81 - 8/82, $15,000. PI.

 Stratiform copper, copper-cobalt, and copper-uranium deposits in sedimentary rocks; National Science Foundation, EAR-80-2645, 4/81 - 9/83, $129,040. Co-PI. (with A. W. Rose)

 Stable isotope geochemistry of hydrothermal systems;

 National Science Foundation, EAR-80-07839, 6/80 - 12/84, $253,699. PI.

 Stratiform copper and copper-cobalt deposits in sedimentary rocks; National Science Foundation, EAR-83-19654, 3/84 - 2/86, $123,000. PI. (with A.W. Rose)

 Geochemical and hydrological processes for the formation of massive sulfide deposits; National Science Foundation, EAR-83-18402, 3/84 - 8/87, $360,000. PI.

 Sulfur and carbon reactions in hydrothermal systems;

 National Science Foundation, EAR-85-08379, 9/85 - 2/89, $390,000. PI.

 Acquisition of a mass spectrometer and a laser ablation system for micro-analyses of sulfur, carbon, oxygen and hydrogen isotopic compositions of natural and synthetic samples; National Science Foundation, EAR-88-03720, 9/1/88 - 8/31/89, $191,000. PI.

 Paragenesis, fluid inclusion, and isotopic investigations of formation of pressure chambers; Gas Research Institute, 11/1/88 - 10/31/91, $224,530. Co-PI. (with T. Engelder).

 Mineralogical and isotopic properties of hydrothermal pyrite in relation to their formational mechanisms; National Science Foundation, EAR-90-04813, 6/1/90 - 12/31/92, $134,695. PI.

 Sulfur chemistry and sulfate reducing bacteria of Archean oceans;

 National Science Foundation, EAR-90-03554, 7/1/90 - 1/31/93, $156,431. PI.

 Formation mechanisms and properties of iron sulfides: collaborate research project between Tohoku University and Penn State University; The Japanese Ministry of Education, Science and Culture, 4/1/90 - 3/31/93, $40,000. (to Tohoku Univ.). PI.

 Kinetics of chemical and isotopic reactions between solids and hydrothermal solutions; The Japanese Ministry of Education, Science and Culture, 4/1/88 - 3/31/91, $200,000. (to Tohoku Univ.). PI.

 Surface environments, biological activities, and elemental cycles in the early Earth;

 The Japanese Ministry of Education, Science and Culture, 4/1/91 - 3/31/95, $1,000,000.(to Tohoku Univ.). PI.

 Roles of hydrothermal processes in biological evolution; The Japanese Ministry of Education, Science, and Culture, 4/1/95 - 3/31/97, $220,000. ( to Tohoku Univ.). PI.

 Kinetics of oxidation of organic matter and pyrite; Nuclear Power Corp., 4/1/95 - 3/31/98, $120,000 (to Tohoku Univ.). PI.

 Applications of stable isotopes in mineral exploration; Metal Mining Agency of Japan, 4/1/93 - 3/31/98, $130,000 (to Tohoku Univ.). PI.

 Origins of gold, uraninite, pyrite, and organic matter in conglomerates of Archean and early Proterozoic; National Science Foundation, 6/1/97 - 5/31/99, $180,000. PI.

 Search for new evidence in pre-2.0 Ga paleosols for the early evolution of atmospheric oxygen and terrestrial biota; NASA Exobiology Program, 1/02/00 - 7/31/03, $180,000. PI.

 Creating the Penn State Astrobiology Research Center; NASA Astrobiology Institute, 7/1/98 - 6/30/03, $4,685,968. PI (with 16 Co-PIs).

 Exploring New Frontiers of the Connections Between the Biological and the Environmental Evolution of the Early Earth; NASA Astrobiology Institute, 7/1/03 – 10/30/03, $774,540. PI (with 16 Co-PIs).

 Kinetics of the formation and transformation of iron oxides in hydrothermal systems; National Science Foundation, 7/1/03 – 6/30/06, $307,997. PI.

 Evolution of a Habitable Planet; NASA Astrobiology Institute, 11/01/03 – 10/31/10, $6,430,646. PI (with 18 Co-PIs).

 Characterizing the early biosphere on land; NASA Exobiology, 5/15/04 – 5/14/05, $135,000. PI.

 Supplement to CA#NNA04C06A Evolution of a Habitable Planet; NASA Astrobiology Institute, 5/01/07 – 04/30/10, $49,397. PI.

 Field workshop on biosignatures in ancient rocks: NASA Astrobiology Institute, 5/01/07 – 04/30/08, $63,253. PI.

 Penn State Astrobiology Research Center: NASA Astrobiology Institute, 2/1/09 – 01/31/14, $6,000,000. Co-PI.

 Multiple sulfur isotope fractionations during thermal decomposition of and thermochemical sulfate reduction by natural organic compounds, NSF 1024550, 09/01/2010 – 8/31/2013, $222,664. PI.

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**PUBLICATIONS OF HIROSHI OHMOTO**

***Editors: Books and Special Issues of Journals***

1. Ohmoto, H. and Horikoshi, E., eds. (1978) Special Issue devoted to the Japan-U.S. Kuroko Research Project: Mining Geology, **28**, no. 15, 215-300.

2. Ohmoto, H. and Skinner, B.J., eds. (1983) The Kuroko and Related Volcanogenic Massive Sulfide Deposits. *Economic Geology* *Monograph* **5**, 604p.

3. Ishihara, S., Urabe, T. and Ohmoto, H. eds. (1993) Proceedings of the 29th international geological congress, Mineral resources symposia volume A. *Resource Geology* *Special Issue* **15**, 460p.

4. Ishihara, S., Urabe, T. and Ohmoto, H. eds. (1993) Proceedings of the 29th international geological congress, Mineral resources symposia volume B. *Resource Geology* *Special Issue* **16**, 360p.

5. Ishihara, S., Urabe, T. and Ohmoto, H. eds. (1993) Proceedings of the 29th international geological congress, Mineral resources symposia volume C. *Resource Geology* *Special Issue* **17**, 375p.

6. Ohmoto, H., ed. (1994) A Special Issue in Honor of Heinrich D. Holland: *Geochimica et Cosmochimica Acta*, **58,** Issue 6 (p.1554-1686).

7. Ohmoto, H. and Stephen E. Kesler, eds. (2006) Evolution of Early Earth’s Atmosphere, Hydrosphere, and Biosphere – Constraints from Ore Deposits. *The Geological Society of America Memoir* **198**, 337p.

***Papers in Referred Journals and Book Chapters***

1. Ohmoto, H. (1964) K-Ar ages of hornblendes of the Hida gneiss complex in central Japan. *Proceedings of the Japan Academy*, **40**, 36-41.

2. Ohmoto, H., Hart, S.R. and Holland, H.D. (1966) Studies in the Providencia area, Mexico, II, K-Ar and Rb-Sr ages of intrusive rocks and hydrothermal minerals. *Economic Geology*, **61**, 1205-1213.

3. Ohmoto, H. and Rye, R.O. (1970) The Bluebell mine, British Columbia. I. Mineralogy, paragenesis, fluid inclusions, and the isotopes of hydrogen, oxygen, and carbon. *Economic Geology*, **65**, 417-437.

4. Greig, J.A., Baadsgaards, H., Cumming, G.L., Folinsbee, R.E., Krouse, H.R., Ohmoto, H., Sasaki, A., and Smejkal, V. (1971) Lead and sulfur isotopes of the Irish base metal mines in Carboniferous carbonate host rocks. *Society of Mining Geologists of Japan, Special Issue* **2**, 84-92.

5. Ohmoto, H. (1971) Fluid inclusions and isotope study of the lead-zinc deposits at the Bluebell mine, British Columbia, Canada. *Society of Mining Geologists of Japan, Special Issue* **2**, 93-99.

6. Ohmoto, H. (1972) Systematics of sulfur and carbon isotopes in hydrothermal ore deposits. *Economic Geology*, **67**, 551-578.

7. Robinson, B.W. and Ohmoto, H. (1973) Mineralogy, fluid inclusions and stable isotopes of the Echo Bay U-Ag-Cu deposits, Northwest Territories, Canada. *Economic Geology*, **68**, 635-656.

8. Rye, R.O., Hall, W.E., and Ohmoto, H. (1974) Carbon, hydrogen, oxygen, and sulfur isotope study of the Darwin lead-silver-zinc deposit, southern California. *Economic Geology*, **69**, 826-842.

9. Rye, R.O. and Ohmoto, H. (1974) Sulfur and carbon isotopes and ore genesis: A review. *Economic Geology*, **69**, 826-842.

10. Ohmoto, H. and Rye, R.O. (1974) Hydrogen and oxyen isotopic compositions of fluid inclusions in the Kuroko deposits, Japan. *Economic Geology*, **69**, 468-481.

11. Ohmoto, H. (1974) F.W. Clark Medal acceptance speech. *Geochimica et Cosmochimica Acta*, **38**, 980-981.

12. Ohmoto, H. (1975) Book Review: E. Roedder, ed., Fluid Inclusion Research*. Economic Geology*, **70**, 1300.

13. Rose, A.W., Barnes, H.L., Burnham, C.W., and Ohmoto, H. (1976) Report on workshop on Research Frontiers in Exploration for Non-Renewable Resources. A Report to the Division of Advanced Energy and Resources Research and Technology: Washington, D.C.: National Science Foundation, 164p.

14. Ohmoto, H. (1977) The present status and future tasks in ore deposit research: U.S.A. and Japan. *Mining Geology*, **27**, 213-220 (in Japanese).

15. Kamilli, R.J. and Ohmoto, H. (1977) Paragenesis, zoning, fluid inclusions, and isotopic studies of the Finlandia vein, Colqui district, central Peru. *Economic Geology*, **72**, 950-982.

16. Ripley, E.M. and Ohmoto, H. (1977) Mineralogic, sulfur isotope, and fluid inclusion studies of the stratabound copper deposits at the Raul mine, Peru. *Economic Geology*, **72**, 1017-1041.

17. Casadevall, T. and Ohmoto, H. (1977) Sunnyside mine, Eureka mining district, San Juan County, Colorado: Geochmeistry of gold and basemetal ore deposition in a volcanic environment. *Economic Geology*, **72**, 1285-1320.

18. Krupka, K.M., Ohmoto, H. and Wickman, F.E. (1977) A new technique in neutron activation analysis of Na/K ratios of fluid inclusions and its application to the gold-quartz veins at the O'Brien mine, Quebec, Canada. *Canadian Journal of Earth Sciences*, **14**, 2760-2770.

19. Ohmoto, H. and Kerrick, D.M. (1977) Devolatilization equilibria in graphitic systems. *American Journal of Science*, **277**, 1013-1044.

20. Ohmoto, H. and Horikoshi, E. (1978) Preface to special issue. *Mining Geology*, **28**, 215-217.

21. Ohmoto, H. (1978) Submarine calderas: A key to the formation of volcanogenic massive sulfide deposits? *Mining Geology*, **28**, 215-217.

22. Guber, A.L. and Ohmoto, H. (1978) Deep sea environment of Kuroko formation as indicated by benthic foraminifera from the Hokuroku district, Japan. *Mining Geology*, **28**, 245-255.

23. Ripley, E.M. and Ohmoto, H. (1979) Oxygen and hydrogen isotopic studies of ore deposition and metamorphism at the Raul mine, Peru. *Geochimica et Cosmochimica Acta*, **43**, 1633-1643.

24. Ripley, E.M. and Ohmoto, H. (1979) A Fortran program for plotting mineral stabilities in the Fe-Cu-S-O system in terms of log (SSO4/SH2S) or logfO2 vs. pH or T. *Computers and Geosciences*, **5**, 289-300.

25. Ohmoto, H. and Rye, R.O. (1979) Isotopes of sulfur and carbon: in H.L. Barnes ed., *Geochemistry of Hydrothermal Ore Deposits, Second Edition*: John Wiley & Sons, 509-567.

26. McLimans, R.K., Barnes, H.L., and Ohmoto, H. (1980) Sphalerite stratigraphy of the Upper Mississippi Valley zinc-lead district, southwest Wisconsin. *Economic Geology*, **75**, 351-361.

27. Burnham, C.W. and Ohmoto, H. (1980) Late-stage processes of felsic magmatism. *Mining Geology*, Special Issue **8**, 1-12.

28. Burnham, C.W. and Ohmoto, H. (1981) Late magmatic and hydrothermal processes in ore formation: Mineral Resources: Genetic Understanding for Practicla Applications. *National Academy Press, Washington*, 62-72.

29. Patterson, D.J., Ohmoto, H., and Solomon, M. (1981) Geological setting and genesis of cassiterite-sulfide mineralization at Renison Bell, western Tasmania. *Economic Geology*, **76**, 393-438.

30. Styrt, M.M., Brackman, A.J., Holland, H.D., Clark, B.C., Pisutha-Arnond, V., Eldridge, C.S., and Ohmoto, H. (1981) The mineralogy and the isotopic composition of sulfur in hydrothermal sulfide/sulfate deposits on the East Pacific Rise at 21˚N. *Earth and Planetary Science Letters*, **53**, 382-390.

31. Kusakabe, M., Chiba, H., and Ohmoto, H. (1982) Stable isotopes and fluid inclusion study of anhydrite from the East Pacific Rise at 21˚N. *Geochemical Journal,* **16**, 89-95.

32. Ohmoto, H. and Lasaga, A.C. (1982) Kinetics of reactions between aqueous sulfates and sulfides in hydrothermal systems. *Geochimica et Cosmochimica Acta*, **46**, 1727-1745.

33. Ohmoto, H. and Skinner, B.J. (1983) The Kuroko and related volcanogenic massive sulfide deposits: Preface and summary of new findings. *Economic Geology, Monograph* **5**, 1-8.

34. Ohmoto, H. (1983) Geologic setting of the Kuroko deposits, Japan. Part I. Geologic history of the Green Tuff region. *Economic Geology, Monograph* **5**, 9-23.

35. Tanimura, S., Date, J., Takahashi, T., and Ohmoto, H. (1983) Geologic setting of the Kuroko deposits, Japan. Part II. Stratigraphy and structure of the Hokuroku district. *Economic Geology, Monograph* **5**, 24-39.

36. Ohmoto, H. and Takahashi, T. (1983) Geologic setting of the Kuroko deposits, Japan: Part III. Submarine calderas and Kuroko genesis. *Economic Geology, Monograph* 5, 39-54.

37. Eldridge, C.S., Barton, P.B., and Ohmoto, H. (1983) Mineral textures and their bearing on formation of the Kuroko ore bodies. *Economic Geology, Monograph* 5, 241-281.

38. Green, G.R., Ohmoto, H., Date, J., and Takahashi, T. (1983) Whole-rock oxygen isotope distribution in the Fukazawa-Kosaka area, Hokuroku district, Japan, and its potential application to mineral exploration. *Economic Geology, Monograph* **5**, 391-411.

39. Tsutsumi, T. and Ohmoto, H. (1983) A preliminary oxygen isotope study of tetsusekiei ores associated with Kuroko deposits in the Hokuroku district, Japan. *Economic Geology, Monograph* 5, 433-438.

40. Pisutha-Arnond, V. and Ohmoto, H. (1983) Thermal histroy, and chemical and isotopic compositions of the ore-forming fluids responsible for the Kuroko massive sulfide deposits in the Hokuroku district of Japan. *Economic Geology, Monograph* 5, 523-558.

41. Mizukami, M. and Ohmoto, H. (1983) Controlling mechanisms for the major element chemistry of aqueous solution in tuff-rich environments. *Economic Geology, Monograp*h **5**, 559-569.

42. Ohmoto, H., Mizukami, M., Drummond, S.E., Eldridge, C.S., Pisutha-Arnond, V., and Lenagh, T. (1983) Chemical processes of Kuroko formation. *Economic Geology, Monograph* **5**, 570-604.

43. Cole, D.R., Ohmoto, H., and Lasaga, A.C. (1983) Isotopic exchange in mineral-fluid systems. I. Theoretical evaluation of oxygen isotopic exchange accompanying surface reactions and diffusion. *Geochimica et Cosmochimica Acta*, **47**, 1681-1693.

44. Wesolowski, D., Drummond, S.E., Mesmer, R.E., and Ohmoto, H. (1984) Hydrolysis equilibria of tungsten (VI) in aqueous sodium chloride solutions to 300˚C. *Inorganic Chemistry*, **23**, 1120-1130.

45. Drummond, S.E. and Ohmoto, H. (1985) Chemical evolution and mineral deposition in boiling hydrothermal systems. *Economic Geology*, **80**, 126-147.

46. Ohmoto (1985) Book Review of "Metal deposits in Relation to Plate Tectonics; Minerals and Rocks" V.16, by F.J. Sawkins, Springer, Verlag, Berlin, 325p. *EOS*, **66**, 93.

47. Wesolowski, D. and Ohmoto, H. (1986) Oxygen isotope fractionation factors between water and minerals scheelite and powellite. Economic Geology, **81**, 471-477.

48. Ohmoto, H. (1986) Stable isotope geochemistry of ore deposits. In J.W. Valley, H.P. Taylor, Jr., and J.R. O'Neil, eds., Reviews in Mineralogy Volume **16**: *Stable Isotopes in High Temperature Geological Processes*: Mineralogical Society of America, 491-560.

49. Cole, D.R. and Ohmoto, H. (1986) Kinetics of isotope exchange at elevated temperatures and pressures. In J.W. Valley, H.P. Taylor, Jr., and J.R. O'Neil, eds., Reviews in Mineralogy Volume 16: *Stable Isotopes in High Temperature Geological Processes*: Mineralogical Society of America, 41-90.

50. Rose, A.W., Smith, A.T., Lustwerk, R.L., Ohmoto, H., and Hoy, L.D. (1986) Geochemical aspects of stratiform and red-bed copper deposits in the Catskill Formation (Pennsylvania, USA) and Redstone area (Canada). Sequence of mineralization in sediment-hosted copper deposits (Part 3). In: G.H. Friedrich et al., eds., *Geology and Metallogeny of Copper Deposits*. Springer-Verlag, Berlin, 412-421.

51. Ohmoto, H. and Felder, R.P. (1987) Bacterial activity in warmer, sulphate-bearing, Archaean oceans. *Nature*, **328**, 244-246.

52. Cole, D.R., Mottl, M.J., and Ohmoto, H. (1987) Isotopic exchange in mineral-fluid systems. II. Oxygen and hydrogen isotopic investigation of the experimental basal-seawater system. *Geochimica et Cosmochimica Acta*, **51**, 1523-1538.

53. Kaiser, C.J. and Ohmoto, H. (1988) Ore-controlling structures of Mississippi Valley-type mineralization on the North American midcontinent as products of late Paleozoic convergent plate tectonism. In Kisvarsanyi, G., ed., *Teconic Control of Ore Deposits:* University of Missouri-Rolla, MO. 424-430.

54. Wesolowski, D., Cramer, J.J., and Ohmoto, H. (1988) Scheelite mineralization in skarns adjacent to Devonian granitoids at King Island, Tasmania. In R.P. Taylor, ed., *Recent Advances in the Geology of Granite Related Mineral Deposits*. Can. Inst. of Mining Bull. Acta. Spec. **39**, 135 - 154.

55. Eldridge, C.S., Compston, W., Williams, I.S., Both, R.A., Ohmoto, H., and Walshe, J.L. (1988) Sulfur isotopic variability in sediment hosted massive sulfide deposits as determined using ion microprobe SHRIMP (1): An example from the Rammelsberg ore body. *Economic Geology*, **83**, 443-449.

56. Eldridge, C.S., Ohmoto, H., Boucier, W.L., and Barnes, H.L. (1988) Hydrothermal inoculation and incubation of the chalcopyrite desease in sphalerite. *Economic Geology*, **83**, 978-989.

57. Bluth, G. and Ohmoto, H. (1988) Sulfide-sulfate chimneys on the East Pacific Rise, 11˚ and 13 ˚N latitudes. Part II: sulfur isotopes. In: Martin, R.F., ed., *Recent Hydrothermal Mineralization at Sea floor Spreading Centers*. Canadian Mineralogists, **26**, 505-515.

58. Graham, U., Bluth, G. and Ohmoto, H. (1988) Sulfide-sulfate chimneys on the East Pacific Rise, 11˚ and 13 ˚N latitudes. Part I: mineralogy and paragenesis. In: Martin, R.F., ed., *Recent Hydrothermal Mineralization at Sea floor Spreading Centers*. Canadian Mineralogists, **26**, 487-504.

59. Ohmoto, H. (1988) Progression of ore deposit science from a subordinate to a principal position in the Earth and Planetary Sciences. *Mining Geology*, **38**, 163-171.(in Japanese).

60. Poulson, S. and Ohmoto, H. (1989) Devolatilization equilibria in graphite- pyrite- pyrrhotite bearing pelites, with respect to magma-pelite interaction and dehydration reactions. *Contributions to Mineralogy and Petrology*, **101**, 418-425.

61. Gauthier-Lafaye, F., Weber, F. and Ohmoto, H. (1989) Natural fission reactors of Oklo. *Economic Geology*, **84**, 2286-2295.

62. Eldridge, C.S., Walshe, J.L., Compston, W., Williams, I.S., Both, R.A., and Ohmoto, H. (1989) Sulfur isotope variability in sediment-hosted massive sulfide deposits as determined using the ion microprobe SHRIMP: I. An example from the Rammelsber orebody - A reply. *Economic Geology*, **84**, 453-457.

63. Hoy, L.D. and Ohmoto, H. (1989) Constraints for the genesis of red-bed associated stratiform Cu deposits from S and C mass balance relations. In: R.W. Boyl et al., eds. *Sediment-hosted Stratiform Copper Deposits*, Geol. Assoc. Canada Special Paper 36, 135-149.

64. Ohmoto, H., Kaiser, C.J., and Geer, K.A. (1990) Systematics of sulphur isotopes in recent marine sediments and ancient sediment-hosted basemetal deposits. In: H.M. Herbert & S.E. Ho eds., *Stable Isotopes and Fluid Processes in Mineralisation:* The Univ. of Western Australia Publication No. 23, 70-120.

65. Poulson, S.R. and Ohmoto, H. (1990) An evaluation of the solubility of sulfide sulfur in silicate melts from experimental data and natural samples. *Chemical Geology*, **85**, 57-75.

66. Haruna, M., Ueno, H. and Ohmoto, H. (1990) Development of skarn-type ores at the Tengumori copper deposit of the Kamaishi Mine, Iwate Prefecture, Northeastern Japan. *Mining Geology*, **40**, 223-244.

67. Whelan, J.F., Rye, R.O. and Ohmoto, H. (1990) Isotopic geochemistry of mid-Proterozoic evaporite basin: Balmat, New York. *American Journal of Science*, **290**, 396-424.

68. Kamilli, R.J. and Ohmoto, H. (1990) Crystallization and recrystallization of growth-zoned vein quartz crystals from epithermal systems - implications for fluid inclusion studies - a discussion. *Economic Geology*, **85**, 1084-1085.

69. Chu, Xue-lei and Ohmoto, H. (1991) Kinetics of isotope exchange reactions involving intra- and inter-molecular reaactions. Part I. Rate law for system with two chemical compounds and three exchangeable atoms. *Geochimica et Cosmochimica Acta*, **55**, 1953-1963.

70. Ohmoto, H., Hayashi, K., Ohuma, K., Tsukamoto, K., Kitakaze, A., Nakano, Y., and Yamamoto, T. (1991) Solubility and reaction kinetics of solution-solid reactions determined by *in situ* observations. *Nature*, **351**, 634-636.

71. Hayashi, K., and Ohmoto, H. (1991) Solubility of gold in NaCl- and H2S-bearing aqueous solutions at 250 - 350˚C. *Geochimica et Cosmochim Acta*, **55**, 2111-2126.

72. Poulson, S.R., Kubilius, W.P. and Ohmoto, H. (1991) Local-scale and regional scale geochemical behavior of sulfur in granitoids during the intrusion of the South Mountain Batholith, Nova Scotica, Canada. *Geochimica et Cosmochimica Acta*, **55**, 3809-3830.

73. Kojima, S. and Ohmoto, H. (1991) Hydrothermal synthesis of wurtzite and sphalerite at T = 350˚ - 250˚C. *Mining Geology*, **41**, 313-327.

74. Ohmoto, H. (1992) Biogeochemistry of sulfur and the mechanisms of sulfide-sulfate mineralization in Archean oceans. In M. Schidlowski, S. Golubic, M.M. Kimberley, D.M. Mckirdy, P.A. Trudinger eds., *Early Organic Evolution: Implications for Mineral & Energy Resources*, Springer-Verlag, 378-397.

75. Cole, D.R., Ohmoto, H. and Jacobs, G.K. (1992) Isotopic exchange in mineral-fluid systems. III. Rates and mechanisms of oxygen isotope exchange in the system granite-H2O±NaCl±KCl at hydrothermal conditions. *Geochimica et Cosmochimica Acta*, **56**, 445-466.

76. Ohmoto, H. (1993) Resource geology in new earth sciences. *Resource Geology* Special Issue, No. 13, 5-15. (in Japanese)

77. Hayashi, K., Hiratsuka, M., Nomura, T., and Ohmoto, H. (1993) In situ observation of mineral-solution reactions: solubility determination of minerals in the system containing gaseous species. *Resource Geology*, Special Issue, No. 15, 351-359.

78. Chu, X. and Ohmoto, H. (1993) The role of polysulfides in sulfur isotope exchange reactions in the aqueous sulfide-thiorulfate system. *Resource Geology*, Special Issue, No. 16, 1-8.

79. Jakobsen, U.H. and Ohmoto, H. (1993) Bitumen associated with precipitation of sulphides in a carbonate-hosted vein mineralization, North Greenland. In: Parnell, J., Kucha, H. and Landais, P. eds. *Bitumen in Ore Deposits*, Springer-Verlag, 399-414.

80. Ohmoto, H., Kakegawa, T., and Lowe, D.R. (1993) 3.4-billion-year-old biogenic pyrites from Barberton, South Africa: sulfur isotope evidence. *Science*, **262**, 555-557.

81. Ohmoto, H. and Logsdon, M. (1994) Preface. The Heinrich D. Holland Special Issue: *Geochimica et Cosmochimica Acta*, **58**, 2153-2156.

82. Ohmoto, H., Hayashi, K., and Kajisa, Y. (1994) Experimental study of the solubilities of pyrite in NaCl-bearing aqueous solutions at 250˚- 350˚C. *Geochimica et Cosmochimica Acta*, **58**, 2169-2185.

83. Graham, U.M. and Ohmoto, H. (1994) Experimental study of formational mechanisms of hydrothermal pyrite. *Geochimica et Cosmochimica Acta*, **58**, 2186-2202.

84. Ohmoto, H. (1994) Acceptance of the SEG Silver Medal. *Economic Geology*, **89**, 2028-2030.

85. Poulson, S.R., Ohmoto, H., and Ross, T.P. (1995) Stable isotope geochemistry of waters and gases (CO2, CH4) from the overpressured Morganza and Moore-Sams Fields, Louisiana Gulf Coast. *Applied Geochemistry*, **10**, 407-417.

86. Ohmoto, H. (1996) Formation of volcanogenic massive sulfide deposits. *Ore Geology Review*, **10**, 135-177.

87. Naraoka, H., Ohtake, M., Maruyama, S., and Ohmoto, H. (1996) Non-biogenic graphiite in 3.8 Ga metamorphic rocks from the Isua district, Greenland. *Chemical Geology*, **113**, 251-260.

88. Haruna, M. and Ohmoto, H. (1996) Oxygen isotope study of copper skarns at the Tengumori deposit, Kamaishi mine. *Resource Geology*, **46**, 125-136.

89. Ohmoto, H. (1996) Evidence in pre-2.2 Ga paleosols for the early evolution of atmospheric oxygen and terrestrial biota. *Geology*, **24**, 1135-1138.

90. Hayashi, K. and Ohmoto, H. (1996) Oxygen isotope study of metamorphosed manganese deposits of the Noda-Tamagawa mine, northeast Japan. *Journal of Mineralogy, Petroleum & Economic Geology*, **91**, 408-418.

91. Ohmoto, H. and Goldhaber, M. (1997) Sulfur and carbon isotopes In: Barnes, H.L. ed. *Geochemistry of Hydrothermal Ore Deposits, V.III.* John Wiley & Sons, New York, 517-611.

92. Watanabe, Y., Naraoka, H., Wronkiewics, D.J., Condie, K.C., and Ohmoto, H. (1997) Carbon, nitrogen, and sulfur geochemistry of Archean and Proterozoic shales from the Kaapvaal Craton, South Africa. *Geochimica et Cosmochimica Acta*, **61**, 3441-3459.

93. Hayashi, K., Fujisawa, H., Holland, H.D., and Ohmoto, H. (1997) Geochemistry of ~1.9 Ga sedimentary rocks from northeastern Labrador, Canada. *Geochimica et Cosmochimica Acta*, **61**, 4115-4138.

94. Ohmoto, H. (1997) Evidence in pre-2.2 Ga paleosols for the early evolution of atmospheric oxygen and trrestrial biota: Reply. *Geology*, **25**, 858-859.

95. Ohmoto, H. (1997) When did the Earth's atmosphere become oxic? *The Geochemical News,* Fall, 1997, 12-13 and 26-27.

96. Manaka, M., Tsukamoto, K., and Ohmoto, H. (1997) The differences in dissolution mechanisms of n- and p-type pyrite crystals. *Japanese J. of Crystal Growth*, **24**, 261-269.

97. Kakegawa, T. and Ohmoto, H. (1998) Origins of pyrites in the ~2.5 Ga Mt. McRae Shale, the Hamersley district, western Australia. *Geochimica et Cosmochimica Acta*, **62**, 3205-3220.

98. Kojima, S. Hanamuro, T., Hayashi, K., Haruna, M., and Ohmoto, H. (1998) Sulphide minerals in Early chemical sedimentary rocks of the eastern Pilbara district, Western Australia. *Mineralogy and Petrology*, **64**, 219-235

99. Kakegawa, T. and Ohmoto, H. (1999) Sulfur isotope evidence for the origin of 3.4 to 3.1 Ga pyrite at the Princeton gold mine, Barberton Greenstone Belt, South Africa. *Precambrian Research*, **96**, p. 209-224.

100. Ohmoto, H. (1999) Redox state of the Archean atmosphere: Evidence from detrital heavy minerals in ca. 3250-2750 Ma sandstones from the Pilbara Craton, Australia: Comment. *Geology*, **27**, 1151-1152.

101. Kamei, G. and Ohmoto, H. (2000) The kinetics of reactions between pyrite and O2-bearing water revealed from in situ measurements of DO, Eh and pH in a closed system. *Geochimica et Cosmochimica Acta*, **64**, 2585-2601.

102. Kakegawa, T., Kasahara, Y., Hayashi, K., and Ohmoto, H. (2000) Sulfur and carbon isotope analyses of the 2.7 Ga Jeerinah Formation, Fortescue Group, Australia. *Geochemical Journal,* **34**, 121-133.

103. Liu, Y., Naraoka, H., Hayashi, K., and Ohmoto, H. (2000) Laser microprobe technique for stable carbon isotope analyses of organic carbon in sedimentary rocks. *Geochemical Journal*, **34**, 195-205.

104. Watanabe, Y., Martini, J.E.J., Ohmoto, H. (2000) Geochemical evidence for terrestrial ecosystems 2.6 billion years ago. *Nature*, **408,** 574-578.

105. Hayashi, K., Shibata, H., Yui, M., and Ohmoto, H. (2001) Experimental study assessing the role of sedimentary organic materials to control the redox state of groundwater: consumption of dissolved oxygen by humic acid. *Resources Geology*, **51,** 45-54.

106. Ohmoto, H., Yamaguchi, K.E., and Ono, S. (2001) Questions regarding Precambrian sulfur isotope fractionation. *Science*, **292**, 1959a.

107. Lasaga, A.C. and Ohmoto, H. (2002) The oxygen geochemical cycle: Dynamics and stability. *Geochimica et Cosmochimica Acta*, **66**, 361-381.

108. Yoshida, T., Hayashi, K., and Ohmoto, H. (2002) Dissolution of iron hydroxides by marine bacterial siderophore. *Chemical Geology*, **184,** 1-9.

109. Beukes, N.J., Doland, H., Guzmer, J., Nedachi, M., and Ohmoto, H. (2002) Tropical laterites, life on land, and the history of atmospheric oxygen in the Paleoproterozoic. *Geology*, **30,** 491-495.

110. Ohmoto, H. (2003) Reply to comments by H. D. Holland on “The oxygen geochemical cycle: Dynamics and stability,” *Geochim. Cosmochim. Acta* 66, 361-381, 2002. *Geochimica et Cosmochimica Acta,* **67**, 791-795.

111. Ohmoto, H. (2003) Non-redox transformation of magnetite–hematite in hydrothermal systems. *Economic Geology,* **98**, 157-161.

112. Haruna, M., Hanamuro, T., Uyeda, K., Fujimaki, H., and Ohmoto, H. (2003) Chemical, isotopic, and fluid inclusion evidence for the hydrothermal alteration of the footwall rocks of the BIF-hosted iron ore deposits in the Hamersley district, Western Australia. *Resource Geology*, **53**, 75-88.

113. Ohmoto, H., Spangler, K. R., Watanabe, Y., and Kamei, G. (2004) Smectite dissolution kinetics in high-alkaline conditions. In: Oversby, V. M. & Werme, L. O. eds. *Scientific Basis for Nuclear Waste Management XXVII*, Materials Research Society, **807,** 723-728.

114. Ohmoto, H. (2004) Archean atmosphere, hydrosphere, and biosphere. In: P. Erickson et al., eds. *The Precambrian Earth: Tempos in Precambrian.* Development in Precambrian Geology **12*,*** 361-368, Elsevier.

115. Watanabe, Y., Stewart, B.W., and Ohmoto, H. (2004) Organic- and carbnate-rich soil formation ~2.6 billion years ago at Schagen, East Transvaal district, South Africa. *Geochim. Cosmochim. Acta* **68,** 2129-2151.

116. Ohmoto, H., Watanabe, Y., and Kumazawa, K. (2004) Evidence from massive siderite beds for a CO2-rich atmosphere before ~1.8 billion years ago. *Nature* **429,** 395-399.

117. Jiménez-López, C., Romanek, C., Huertas, F. V., Ohmoto, H., and Caballero, E. (2004) Oxygen isotope fractionation in synthetic magnesian calcite. *Geochim. Cosmochim. Acta*, v. 68, p. 3367-3377.

118. Ohmoto, H. and Watanabe, Y. (2004) Reply to “Archaean atmosphere and climate” by Kasting J. and “Archaean paleosols and Archaean air” by Sleep, M.H., *Nature,* 25 November 204/www/naure.com/nature, 1-2.

119. Nedachi, Y., Nedachi, M., Bennett, G., and Ohmoto, H. (2005) Geochemistry and mineralogy of the 2.45 Ga Pronto paleosols, Ontario, Canada. *Chem. Geol.,* **214,** 21-44.

120. Yamaguchi, K.E., Johnson, C.M., Beard, B.L., and Ohmoto, H. (2005) Biogeochemical cycling of iron in the Archean-Paleoproterozoic Earth: Constraints from iron isotope variations in sedimentary rocks from the Kaapvaal and Pilbara Cratons. *Chem. Geol.,* **214,** 135-169.

121. Yamaguchi, K.E. & Ohmoto, H. (2006) Comments on “Iron isotope constraints on the Archean and Paleoproterozoic ocean redox state”. *Science*, **311,** 177a.

122. Kato, Y., Yamaguchi, K., and Ohmoto, H. (2006) Rare earth elements in Precambrian banded iron formations: Secular changes of Ce and Eu anomalies and evolution of atmospheric oxygen. In Kesler, S. and Ohmoto, H. eds. Evolution of the Atmosphere, Hydrosphere, and Biosphere on Early Earth: Constraints from Ore Deposits, *Geological Society of America Monograph* **198***,* 269-289.

123. Yamaguchi, K.E. and Ohmoto, H. (2006) Evidence from sulfur isotope and trace elements in pyrites for their multiple post-depositional processes in uranium ores at the Stanleigh Mine, Elliot Lake, Ontario, Canada. In Kesler, S. and Ohmoto, H. eds. Evolution of the Atmosphere, Hydrosphere, and Biosphere on Early Earth: Constraints from Ore Deposits, *Geological Society of America Monograph* **198***,* 143-156.

124. Ohmoto, H., Watanabe, Y., Yamaguchi, K.E., Naraoka, H., Kakegawa, T., Haruna, M., Hayashi, K., and Kato, Y. (2006) Chemical and biological evolution of early Earth: Constraints from banded iron-formations. In Kesler, S. and Ohmoto, H. eds. Evolution of the Atmosphere, Hydrosphere, and Biosphere on Early Earth: Constraints from Ore Deposits, *Geological Society of America Monograph* **198***,* 291-331.

125. Ishihara, S., Ohmoto, H., Anhaeusser, C. R., Imai, A. & Robb, L. J. (2006) Discovery of the oldest oxidized granitoids in the Kaapvaal Craton and its implications for the redox evolution of early Earth. In Kesler, S. and Ohmoto, H. eds. Evolution of the Atmosphere, Hydrosphere, and Biosphere on Early Earth: Constraints from Ore Deposits, *Geological Society of America Monograph* **198***,* 67-80.

126. Ohmoto, H., Watanabe, Y., Ikemi, H., Poulson, S. R. & Taylor, B. E. (2006) Sulphur isotope evidence for an oxic Archaean atmosphere. *Nature*, **442**, 908-911.

127. Yamaguchi, K.E. and Ohmoto, H. (2006) Geochemical and isotopic constratints on the origin of Paleoproterozoic red shales of the Garagara/Mapedi Formation, Postmasburg Group, South Africa. *South African J. of Geology,* **109**, 123-138.

128. Yamaguchi, K.E., Johnson, C.M., Beard, B.L., Beukes, N.J., Gutzmer, J., and Ohmoto, H. (2007) Isotopic evidence for iron mobilization during Paleoproterozoic laterization of the Hekpoort paleosol profile from Gaborone, Botzwana. *Earth & Planetary Scie Letters,* **256,** 577-587.

129. Otake, T., Wesolowski, D. J., Lawrence, M. A., Lawrence, F. A. & Ohmoto, H. (2007) Experimental evidence for non-redox transformations between magnetite and hematite under H2-rich hydrothermal conditions. *Earth and Planetary Science Letters,* **257**, 60-70.

130. Otake, T., Lasaga, A.C., and Ohmoto, H. (2008) Ab initio calculations for equilibrium fractionations in multiple sulfur isotope systems. *Chemical Geology* **249,** 357-376*.*

131. Lasaga, A.C., Otake, T., Watanabe, Y. and Ohmoto, H. (2008) Anomalous fractionation of sulfur isotopes during heterogenous reactions. *Earth & Planetary Sciece Letters*. **268,** 225-238.

132. Hayashi, K-I., Naraoka, H., and Ohmoto, H. (2008) Oxygen isotope study of Proterozoic banded iron formation, Hamersley Basin, Western Australia. *Resources Geology* **58,** 43-51.

134. Ohmoto, H., Runnegar, B., Kump, L.R., Fogel, M.L., Kamber, B., Anbar, A.D., Knauth, P.L., Lowe, D.R., Sumner, D.Y., and Watanabe, Y. (2008) Biosignatures in ancient rocks: a summary of discussions at a field workshop on biosignatures in ancient rocks.  *Astrobiology* **8,** 883-907.

133. Kato, Y., Suzuki, K., Nakamura, K., Hickman, A.H., Nedachi, M., Kusakabe, M., Bevacqua, D.C., and Ohmoto, H. (2009) Hematite formation by oxygenated groundwater more than 2.76 billion years ago. *Earth & Planetary Science Letters* **278,** 40-49.

134. Hoashi, M., Bevacqua, D.C., Otake, T., Watanabe, Y., Hickman, A., Utsunomiya, S., and Ohmoto, H. (2009) Primary haematite formation in an oxygenated sea 3.46 billion years ago. *Nature Geoscience,* **2,** 301-306.

135. Watanabe, Y., Farquhar, J., and Ohmoto, H. (2009) Anomalous fractionations of sulfur isotopes during thermal sulfate reduction. *Science*, 324, 370-373.

136. Ohmoto, H. (2010) Dioxygen. *Encyclopedia of Astrobiology*.

137. Otake, T., Wesolowski, D.J., Anoviz, L.M., and Ohmoto, H. (2010) Mechanisms of iron oxide transformation in hydrothermal systems. *Geochimica et Cosmochimica Acta,* 74, 6141-6156.

138. Ohmoto, H., Watanabe, Y., Lasaga, A.C., Naraoika, H., Johnson, I., Brainard, J., and Chorney, A. (2014) Oxygen, iron, and sulfur geochemical cycles on early Earth: Paradigms and contradictions. 6Ed. Shaw, G.H. *Earth’s Early Atmosphere and Surface Environment.*The Geol. Soc. Am., Special Paper **55,** 55-96.

139. Grettenberger, C.L., Rench, R.L., Gruen, D.D., Mills, D.B., Carney, C., Brainard, J.B., Hamasaki, H., Ramirez, R., Watanabe, Y., Amara-Zettler, L.A., Ohmoto, H. & Macalady, J.L. (2020) Microbial population structure in a stratified, acidic pit lake in the Iberian Pyrite Belt. *Geomicrobiology J.*, **37,** 623-634 (2020).

139. Ohmoto, H. A seawater-sulfate origin for early Earth’s volcanic sulfur. *Nature Geoscience* **13,** 576-583 (2020).

***Papers in in-House Newsletter***

1. Ohmoto, H. (1975) Isotopes and the genesis of ore deposits. Earth and Mineral Sciences, The Pennsylvania State University, **44**, 68-70.

2. Ohmoto, H. (1985) Hot springs, volcanism, and geochemical cycles. Earth and Mineral Sciences, The Pennsylvania State University, **55**, 6-8.

***Abstracts of Papers Presented At National and International Scientific Meetings (Refereed Abstracts Only)***

1. Ohmoto, H., Hart, S.R., and Holland, H.D. (1966) K-Ar and Rb-Sr ages of rocks and hydrothermal minerals in the Providencia area, Mexico. Abstracts with Programs, The Geological Society of America, Annual Meeting, San Francisco, California, p. 152-153.

2. Ohmoto, H. and Rye, R.O. (1968) The ores of the Bluebell mine, British Columbia: a product of meteoric water? Abstracts with Programs, The Geological Society of America, Annual Meeting, Mexico City, Mexico, p. 222-223.

3. Ohmoto, H., Borcsik, M., and Holland, H.D. (1969) Chemistry and origin of hydrothermal fluids at the Bluebell mine, British Columbia. Abstracts with Programs, The Geological Society of America, Annual Meeting, Atlantic City, New Jersey, p. 165.

4. Ohmoto, H. (1970) Influence of pH and fO2 of hydrothermal fluids on the isotopic composition of sulfur species. Abstracts with Programs, The Geological Society of America, Annual Meeting, Milwaukee, Wisconsin, p. 640.

5. Ohmoto, H., Kajiwara, Y., and Date, J. (1970) The Kuroko ores in Japan: products of seawater? Abstracts with Programs, The Geological Society of America, Annual Meeting, Milwaukee, Wisconsin, p. 640.

6. Greig, J.A., Baadsgaard, H., Cumming, G.L., Folinsbee, R.E., Krouse, H.R., Ohmoto, H., Sasaki, A., and Smejkal, V. (1970) Lead and sulfur isotopes of the Irish base metal mines in Carboniferous carbonate host rocks. Collected Abstracts, IMA-IAGOD Meetings, Kyoto, Japan, p. 131.

7. Ohmoto, H. (1970) Fluid inclusions and isotope study of the lead-zinc deposits at the Bluebell mine, British Columbia, Canada. Collected Abstracts, IMA-IAGOD Meeting, Kyoto, Japan, p. 132.

8. Ohmoto, H. (1970) Fluid inclusions and isotope study of the lead-zinc deposits at the Bluebell mine, British Columbia, Canada. Abstracts, 1970 International Symposium on Hydrogeochemistry and Biogeochemistry, Tokyo, Japan, p. 23.

9. Ohmoto, H. (1973) Origin of hydrothermal fluids responsible for the Kuroko deposits in Japan. Abstracts, American Institute of Mining and Engineering, Annual Meeting, Chicago, Illinois, p. 790.

10. Rye, R.O. and Ohmoto, H. (1973) Carbon and sulfur isotopes and ore genesis: a review. Abstracts with Programs, The Geological Society of America, Annual Meeting, Dallas, Texas, p. 790.

11. Casadevall, T. and Ohmoto, H. (1974) Sunnyside mine, San Juan County, Colorado: Results of mineralogic, fluid inclusion and stable isotope studies. Abstracts with Programs, The Geological Society of America, Annual Meeting, Miami Beach, Florida, p. 684.

12. Ohmoto, H. and Shettel, D.L. (1974) Effects of f O2 on the hydrogen and oxygen isotopic compositions of minerals at high temperatures and pressures. Abstracts with Programs, The Geological Society of America, Annual Meeting, Miami Beach, Florida, p. 898.

13. Kamilli, R.J. and Ohmoto, H. (1975) Isotopic and chemical evolution of the hydrothermal fluids responsible for the Pb-Zn-Ag-Au mineralization of the Finlandia vein, Colqui district, Department of Lima, Peru. The Geological Society of America, Annual Meeting, Salt Lake City, Utah, p. 1137-1138.

14. Ohmoto, H., Kerrick, D.M., and Shettel, D.L. (1975) Stability of graphite-bearing metamorphic mineral assemblages in a P-T-fO2 space. Abstracts with Programs, The Geological Society of America, Annual Meeting, Salt Lake City, Utah, p. 1217-1218.

15. Patterson, D. and Ohmoto, H. (1976) Stable isotope and fluid inclusion study of the Renison Bell cassiterite-sulfide deposits, western Australia. Abstracts, International Conference on Stable Isotopes, Lower Hutte, New Zealand, p.52.

16. Ohmoto, H., Cole, D.R., and Mottl, M.J. (1976) Experimental basalt-seawater interaction: sulfur and oxygen isotope studies. EOS, **57**, p. 342.

17. Ohmoto, H. (1976) Applications of experimental data on the fractionation of stable isotopes to probems of ore genesis. Abstracts, 25th International Geological Congress, Sydney, Australia, **3**, p. 781.

18. Casadevall, T. and Ohmoto, H. (1976) Sunnyside mine, Eureka mining district, San Juan County, Colorado: geochemistry of gold and basemetal ore formation in volcanic environment. Abstracts, 25th International Congress, Sydney, Australia, **3**, p.865.

19. Shettel, D.L., Jr., Ohmoto, H., and Burnham, C.W. (1976) Oxygen isotopic fractionation between H2O and hydrous silicate melts: Abstracts with Programs, The Geological Society of America, Annual Meeting, Denver, Colorad, p. 1105.

20. Cole, D.R. and Ohmoto, H. (1976) Effect of NaCl on the rate of oxygen isotopic exchange reactions between rocks and water. Abstracts with Programs, The Geological Society of America, Annual Meeting, Denver, Colorado, p. 817.

21. Ohmoto, H. (1977) Submarine calderas: a key to the formation of massive sulfide deposits? Abstracts with Programs, The Geological Society of America, Annual Meeting, Seattle, Washington, p.1118-1119.

22. Cole, D.R. and Ohmoto, H. (1977) The degree of oxygen isotopic exchange between rocks and hydrothermal fluids of meteoric water. Abstracts with Programs, The Geological Society of America, Annual Meeting, Seattle, Washington, p. 931-932.

23. Ohmoto, H. (1977) Seawater and ore-formation. Annual Meetings of the Society of Mining Geologicsts of Japan, Mining Geology, **27**, p. 53.

24. Burnham, C.W. and Ohmoto, H. (1978) Late magmatic and hydrothermal processes in ore formation. Abstracts with Programs, The Geological Society of America, Annual Meeting, Toronto, Canada, p. 375.

25. Oskvarek, J.D. and Ohmoto, H. (1978) Oxygen isotope exchange in the system muscovite-H2O-CO2. Abstracts with Programs, The Geological Society of America, Annual Meeting,, Toronto, Canada, p. 466..

26. Drummond, S.E., Ohmoto, H., and Barnes, H.L. (1979) Solubility of CO2 in aqueous NaCl solutions. EOS, **60,** p. 422.

27. Segalstad, T.V. and Ohmoto, H. (1979) Oxygen isotope studies of igneous rocks in the Oslo Rift, Norway, a preliminary report. Sixth European Colloquim on Geochronology and Isotope Geology, Lillehammer, Norway, p. 85.

28. Howe, S.S., Ohmoto, H., and Rose, A.W. (1979) Sulfur isotopes of lead-zinc occurences in central Pennsylvania. Abstracts with Programs, The Geological Society of America, Northeastern Section, Annual Meeting, p. 16.

29. Drummond, S.E. and Ohmoto, H. (1979) Effects of boiling on mineral solubilities in hydrothermal solutions. Abstracts with Programs, The Geological Society of America Annual Meetings, San Diego, California, p. 416.

30. Cole, D.R. and Ohmoto, H. (1979) Mechanism of oxygen isotope exchange between aqueous solutions and granitic rocks. Abstracts with Programs, The Geological Society of America, Annual Meeting, San Diego, Californaia, p. 403.

31. Segalstad, T.V. and Ohmoto, H. (1980) Petrogenetic implication of oxygen isotope studies of plutonic rocks from the Oslo Rift, Norway. EOS, **61**, p. 410.

32. Cole, D.R. and Ohmoto, H. (1980) Mechanism and rates of oxygen isotope exchange in experimental hydrothermal systems. Proceedings of the Third International Symposium on Water-Rock Interaction, Edmonton, Canada, p. 64-66.

33. Drummond, S.E. and Ohmoto, H. (1980) Chemical modeling of hydrothermal fluid mixing. Abstracts with Programs, The Geological Society of America, Annual Meeting, Atlanta, Geogia, p.417.

34. Eldridge, C.S. and Ohmoto, H. (1980) Vertical zoning in massive sulfide deposits: the inverse of their paragenesis. Abstracts with Programs, The Geological Society of America, Annual Meeting, Atlanta, Georgia, p. 420.

35. Green, G.R., Ohmoto, H., Date, J., and Takahashi, T. (1980) Oxygen isotope and alteration zonation in volcanic rocks from around the Fukazawa Kuroko deposit, Japan, and its implication for mineral exploration. Abstracts with Programs, The Geological Society of America, Annual Meeting, Atlanta, Georgia, p. 436-437.

36. Ohmoto, H. and Lasaga, A.C. (1980) Kinetics of isotopic exchange and chemical reactions between sulfides and sulfates in hydrothermal solutions. Abstracts with Programs, The Geological Society of America, Annual Meeting, Atlanta, Georgia, p. 494.

37. Pisutha-Arnond, V. and Ohmoto, H. (1980) Chemical and isotopic compositions of the Kuroko ore-forming fluids. Abstracts with Programs, The Geological Society of America, Annual Meeting, Atlanta, Georgia, p. 500.

38. Styrt, M.M., Holland, H.D., and Ohmoto, H. (1980) The mineralogy and the isotopic composition oif sulfur in hydrothermal sulfide/sulfate deposits on the East pacific Rise, 21˚N latitute. Abstracts with Programs, The Geological Society of America, Annual Meeting, Atlanta, Georgia, p. 531.

39. Ohmoto, H. (1981) Overview of the U.S.-Japan-Canada cooperative research project on the genesis of volcanogenic massive sulfide deposits. Joint Annual Meetings of the Geological Association of Canada, Mineralogical Association of Canada, and Canadian Geophysical Union, Calgary, Canada, **6**, A-44.

40. Guber, A.L., Ohmoto, H., and Date, J. (1981) The Hokuroku model as an exploration guide for Kuroko-type deposits. Joint Annual Meetings of the Geological Association of Canada, Mineralogical Association of Canada, and Canadian Geophysical Union, Calgary, Canada, **6**, A-23.

41. Green, G.R. and Ohmoto, H. (1981) The application of oxygen isotope analyses to the exploration for volcanogenic massive sulfide deposits. Joint Annual Meetings of the Geophysical Union, Calgary, Canada, **6**, A-23.

42. Cole, D.R., Ohmoto, H., and Lasaga, A.C. (1981) Rates of oxygen and hydrogen isotopic exchange in mineral-fluid systems: surface exchange versus diffusion. Abstracts with Programs, The Geological Society of America, Annual Meeting, Cincinnati, Ohio, p. 428.

43. Pisutha-Arnond, V., Eldridge, C.S., and Ohmoto, H. (1981) Thermal history of the ore-forming fluids responsible for the Kuroko massive sulfide deposits in Japan. Abstracts with Programs, The Geological Society of America, Annual Meeting, Cincinnati, Ohio, p. 334.

44. Wesolowski, D. and Ohmoto, H. (1981) Remobilization of molybdenum from W-Mo skarns by late meteoric fluids at King Island, Tasmania. Abstracts with Programs, The Geological Society of America, Annual Meeting, Cincinnati, Ohio, p. 578.

45. Cole, D.R. and Ohmoto, H. (1982) The estimates for oxygen isotopic exchange during mineral-fluid interaction in hydrothermal systems. Abstracts with Programs, The Geological Society of America, Annual Meeting, New Orleans, Louisiana, p. 486.

46. Eldridge, C.S. and Ohmoto, H. (1982) Sulfur isotopic study of pyrite in sedimentary rocks surrounding the Kuroko deposits. Abstracts with Programs, The Geological Society of America, Annual Meeting, New Orleans, Louisiana, p. 482.

47. Kubilius, W.P. and Ohmoto, H. (1982) Sulfur isotope study of peraluminous granitoids and associated metasediments, southern Nova Scotia, Canada. Abstracts with Programs, The Geological Society of America, Annual Meeting, New Orleans, Louisiana, p. 536.

48. Tsutsumi, M. and Ohmoto, H. (1982) Iron formation associated with the Kuroko deposits: a product of low-18 oxygen seawater? Abstracts with Programs, The Geological Society of America, Annual Meeting, New Orleans, Louisiana, p. 634.

49. Wesolowski, D., Drummond, S.E., Mesmer, R.E., and Ohmoto, H. (1982) Tungsten speciation in NaCl solutions to 300˚C. Abstracts with Programs, The Geological Society of America, Annual Meeting, New Orleans, Louisiana, p. 645.

50. Eldridge, C.S., Shimizu, N., Hart, S.R., and Ohmoto, H. (1983) Ion microprobe measurement of the sulfur isotopic composition of galena from Kuroko ores. Abstracts with Programs, The Geological Society of America, Annual Meeting, Indianapolis, Indiana, p. 567.

51. Ohmoto, H., Drummond, S.E., Eldridge, C.S., Pisutha-Arnond, V., and Barton, P.B., Jr. (1983) Chemical processes of formation of Kuroko-type deposits. Extended Abstracts, Fourth International Symposium in Water-Rock Interaction, Misasa, Japan, p. 373-375.

52. Ohmoto, H., Mizukami, M., Eldridge, C.S., Pisutha-Arnond, V., and Green, G.R. (1983) Origin of fluids and hydrology in the Kuroko ore-forming systems. Extended Abstracts, Fourth International Symposium in Water-Rock Interaction, Misasa, Japan, p. 376-378.

53. Mizukami, M. and Ohmoto, H. (1983) Hydrothermal reactions in smectite-rich environments. Extended Abstracts, Fourth International Symposium in Water-Rock Interaction, Misasa, Japan, p. 344-345.

54. Wesolowski, D. and Ohmoto, H. (1983) Oxygen isotope fractionation in the mineral scheelite and powellite from theoretical calculations. EOS, **64**, p. 335.

55. Bourcier, W.L., Eldridge, C.S., Barnes, H.L., and Ohmoto, H. (1984) The chalcopyrite disease in Kuroko ore: an experimental investigation. Abstracts with Programs, The Geological Society of America, Annual Meeting, Reno, Nevada, p. 452.

56. Ohmoto, H. (1984) Applications of sulfur and carbon isotopes to ore genesis research and mineral exploration. Abstracts for International Conference on Recent Advances in the Geochemisry of Ore Deposits, Montreal, Canada, p. 44-45.

57. Ohmoto, H. (1984) Applications of sulfur isotopes to genetic studies and exploration of massive sulfide deposits. Abstracts for International Conference on Stable Isotopes and Fluid Processes in Mineralization, Brisbane, Australia, p. 11-15.

58. Ohmoto, H. and Oskvareck, J.D. (1985) An experimental study of oxygen isotope exchange reactions in the system muscovite-CO2-H2O-KCl-NaCl at T = 400˚-600˚C and P = 5 kb. Programs and Abstracts, Second International Symposium on Hydrothermal Reactions, The Pennsylvania State University, August, 1985, p. 47.

59. Ohmoto, H. (1985) Thermodynamic and kinetic evaluation of the causes of metal-ratio regularities in low temperature hydrothermal deposits. Abstracts with Programs, The Geological Society of America, Annual Meeting, Orlando, Florida, p. 680.

60. Eldridge, C.S., Compston, W., Williams, I.S., Ohmoto, H., Walshe, J.C., and Both, R.A. (1985) Ion microprobe determination of sulfur isotope variation in pyrite from a sample of Rammelsberg ore. Abstracts with Programs, The Geological Society of America, Annual Meeting, Orlando, Florida, p. 614.

61. Hoy, L.D., Ohmoto, H., and Rose, A.R. (1985) Geochemical processes of formation of red-bed associated Cu-Co deposit at Kamoto, Zaire. Abstracts with Programs, The Geological Society of America, Annual Meeting, Orlando, Florida, p. 614.

62. Kaiser, C.J., and Ohmoto, H. (1985) A kinetic model for tectonic structures hosting North American Mississippi Valley-type mineralization: implications for timing and hydrology. Abstracts with Programs, The Geological Society of America, Annual Meeting, Orlando, Florida, p. 622.

63. Wesolowski, D., Sans, J.R., Thornton, C.P., and Ohmoto, H. (1985) Regional trends in the oxygen isotopic compositions of granitoid plutons, central and southern Appalachians. Abstracts with Programs, The Geological Society of America, Annual Meeting, Orlando, Florida, p. 748.

64. Eldridge, C.S., Compston, W., Williams, I.S., Patterson, D.J., Ohmoto, H., Walshe, J.L., and Both, R.A. (1986) SHRIMP ion microprobe determination of sulfur isotopic ratios in some sediment hosted massive sulfide ores: variability in their timing and formation. Terra Cognita, **6**, p. 134.

65. Ohmoto, H. (1986) Systematics of metal ratios and sulfur isotopic ratios in low-temperature basemetal deposits. Terra Cognita, **6**, p. 134-135.

67. Segalstad, T. and Ohmoto, H. (1986) Stable isotope geochemistry of igneous processes in the Permina Oslo Rift, Norway. Terra Cognita, **6**, p. 183.

68. Geer, K.A., Ohmoto, H., and Weiser, J.D. (1986) Zonation, paragenesis and ore textures of the Meggen deposit: evidence for a replacement origin. Abstracts and Programs, The Geological Society of America, Annual Meetings, San Antonio, Texas, p. 611.

69. Bluth, G. and Ohmoto, H. (1986) Sulfur isotope geochemistry of hydrothermal vent sites from the East Pacific Rise at 13˚N. Abstracts and Programs, The Geological Society of America, Annual Meeting, San Antonio, Texas, p. 544.

70. Hoy, L.D., Ohmoto, H. Rose, A.W., Dimanche, F. and Coipel, J. (1986) Constraints for the genesis of redbed associated stratiform Cu deposits from S and C mass balance relations (abst.). Canadian Mineralogist, **24**, p. 203.

71. Ohmoto, H. (1986) Archean massive sulfides: a product of warmer oceans? Abstracts and Programs, The Geological Society of America, Annual Meeting, San Antonio, Texas, p. 710.

72. Geer, K.A. and Ohmoto, H (1987) Ion microprobe sulfur isotopic data from the Meggen deposit: evidence for hydrothermal sulfur. Abstracts and Programs, Annual Meeting, Phoenix, Arizona, p. 673.

73. Chu, X. and Ohmoto, H. (1987) Kinetics of carbon isotope exchange among CO2, CH4, and acetic acid: experimental results at 250˚C. Abstracts with Programs, The Geological Society of America, Annual Meeting, Phoenix, Arizona, p. 619-620.

74. Kaiser, C.J. and Ohmoto, H. (1987) The kinetics of sulfate reduction by organic matter under hydrothermal conditions. Abstracts with Programs, The Geological Society of America, Annual Meeting, Phoenix, Arizona, p. 721.

75. Poulson, S.R. and Ohmoto, H. (1987) The behaviour of sulphur in granodiorite magma during emplacement and during subsolidus hydrothermal alteration. EOS, **68**, p. 1522.

76. Chu, X. and Ohmoto, H. (1988) Rate law for isotopic exchange involving intermolecular and intramolecular reactions. Program and Abstracts, V.M. Goldschmidt Conference, Baltimore, Maryland, p. 36.

77. Geer, K.A. and Ohmoto, H. (1988) Chemical processes of ore formation at the Meggen mine: evidence for carbonate replacement. Program and Abstracts, V.M. Goldschmidt Conference, Baltimore, Maryland, p. 43.

78. Graham, U.M. and Ohmoto, H. (1988) Role of anhydrite formation of marcasite, pyrite, wurtzite, sphalerite and chalcopyrite in the Black-smoker chimneys. Program and Abstracts, V.M. Goldschmidt Conference, Baltimore, Maryland, p. 44.

79. Kaiser, C.J. and Ohmoto, H. (1988) Mechanisms of sulfate reduction by organic matter. Program and Abstracts, V.M. Goldschmidt Conference, Baltimore, Maryland, p. 50.

80. Poulson, S.R. and Ohmoto, H. (1988) Devolatilisation equilibra in graphite-pyrite-pyrrhotite bearing pelites, with respect to magma-pelite interaction and dehydration reactions. Program and Abstracts, V.M. Goldschmidt Conference, Baltimore, Maryland, p. 67.

81. Chu, X. and Ohmoto, H. (1988) The role of polysulfide and thiosulfate in the isotopic exchange kinetics between aqueous sulfide and sulfate. Abstracts with Programs, The Geological Society of America, Ann. Mtgs., Denver, Colorado, A-153.

82. Graham, U.M. and Ohmoto, H. (1988) Mineralogical and chemical processes of wurtzite and sphalerite formation in black smoker chimneys. Abstracts with Programs, The Geological Society of America, Ann. Mtgs., Denver, Colorado, A-96.

83. Ohmoto, H. and Geer, K.A. (1988) Studies on the origin of sediment hosted massive sulfide deposits. I. Ore occurrence and metal zoning at Meggen, W. Germany. Mining Geology, **38**, p. 82-83.

84. Ohmoto, H., Eldridge, C.S. and Geer, K.A. (1988) Studies on the origin of sediment hosted massive sulfide deposits. II. Ion microprobe analyses on sulfur isotopic composition of sulfides. Mining Geology, **38**, p. 83.

85. Ohmoto, H. (1988) Sulfur chemistry and sulfate-reducing bacterial activity of Archean oceans: Abstract for 9th Alfred Wegener Conference on Early Organic Evolution: Implications for Mineral and Energy Resources. Terra Cognita, **8**, p. 223.

86. Ohmoto, H. (1989) Archean volcanogenic massive sulfide deposits: products of warmer sulfate-bearing oceans and warmer crusts. Abstracts, 28th International Geological Congress, Washington, D.C., **2**, p.2-541.

87. Graham, U.M. and Ohmoto, H. (1989) Formational mechanisms of iron-sulfides in sulfate-sulfide chimneys at the East Pacific Rise 11-13 ˚N. Abstracts, 28th International Geological Congress, Washington, D.C., **1**, p. 1-577.

88. Ohmoto, H., Tsukamoto, K., Hayashi, K., Kitakaze, A., Onuma, K., Nakano, Y., and Yamamoto, Y. (1989) In situ observation of solid-fluid reactions: I. Dissolution rates and solubilities of gypsum and barite in aqueous solutions at 15˚-80˚C. Abstracts with Programs, Geol. Soc. America, Ann. Mtgs., St. Lois, A-102.

89. Graham, U.M. and Ohmoto, H. (1989) Hydrothermal experiments on the roles of pyrrhotite and anhydrite in the formation of pyrite. Abst. with Programs, Geol. Soc. America, Ann. Mtgs., St. Lois, A-104.

90. Jacobsen, U.H. and Ohmoto, H. (1989) The environments of organic accumulation in open/closed cycles of the North Greenland Basin. Abst. with Programs, Geol. Soc. America, Ann. Mtgs., St. Lois, A-159-160.

91. Poulson, S.R. and Ohmoto, H. (1989) Sulfur isotope trends in granodiorite from the margin of the South Mountain batholith, Nova Scotia. Abst. with Programs, Geol. Soc. America, Ann. Mtgs., St. Lois, A-325.

92. Haruna, M., Ueno, H. and Ohmoto, H. (1989) Paragenesis and fluid inclusion study of skarnization and ore mineralization at the Tengumori deposit, Kamaishi mine. Mining Geology, **39**, p. 62-63.

93. Hayashi, K., Kitakaze, A., Tsukamoto, K., Ohmoto, H. (1989) Development of in-situ observation systems for hydrothermal reactions. Mining Geology, **39**.

94. Yamaguchi, H., Yamada, R., and Ohmoto, H. (1989) Migration of elements in the footwall rocks of the Fukaza Kuroko deposits. I. Major elements. Mining Geology, **39**.

95. Yamaguchi, H., Yamada, R., and Ohmoto, H. (1989) Migration of elements in the footwall rocks of the Fukaza Kuroko deposits. II. Base metals. Mining Geology, **39**.

96. Ohmoto, H., Onuma, K., Nakano, Y., Tsukamoto, K., and Kitakaze, A. (1989) Study of reaction kinetics between mineral and solution using in-situ observation metho. I. Gypsum. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p. 127.

97. Hayashi, K., Yamamoto, Y., Tsukamoto, K., and Ohmoto (1989) Study of reaction kinetics between mineral and solution using in-situ observation method. II. Barite. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p. 128.

98. Saito, T., Hayashi, K., and Ohmoto, H. (1989) Formational processes of Zn-S minerals at the Hosokura Mine, Iwate Prefecture. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p. 129.

99. Kajisa, Y., Kitakaze, A., and Ohmoto, H. (1989) Formational processes of Fe-S minerals at the Hosokura Mine, Iwate Prefecture. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p. 130.

100. Yamaguchi, H., Yamada, R., and Ohmoto, H. (1989) Migration of elements in the footwall rocks of the Fukaza Kuroko deposits: Alkali and calc-alkaline elements. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p. 109.

101. Ohmoto, H. (1989) Interpretation of geochemical characteristics of Archean massive sulfide deposits. I. Mineralogy and metal ratios. Mining Geology, **39**, p. 53.

102. Ohmoto, H. (1989) Interpretation of geochemical characteristics of Archean massive sulfide deposits. II. Sulfur isotope ratios. Mining Geology, **39**, p. 53.

103. Hayashi, K. and Ohmoto, H. (1990) Gold solubility in the NaCl-S˚-H2S system. Ann. Mtg. of Society of Mining Geologists, Tokyo. Mining Geology, **40**, p. 68.

104. Kojima, S. and Ohmoto, H. (1990) Natural occurrences anf formation condition of wurtzite inferred from hydrothermal recrystallization experiments. Ann. Mtg. of Society of Mining Geologists, Tokyo. Mining Geology, **40**, p. 68.

105. Saito, T., Hayashi, K. and Ohmoto, H. (1990) In-situ observation method for determination of solubility of ZnS in low temperature aqueous solutions. Ann. Mtg. of Society of Mining Geologists, Tokyo; Mining Geology, **40**, p. 68-69.

106. Kajisa, Y., Kitakaze, A. and Ohmoto, H. (1990) Solubilities of pyrite and marcasite in NaCl-S˚-H2S system. Ann. Mtg. of Society of Mining Geologists, Tokyo. Mining Geology, **40**, p. 69.

107. Ohmoto, H. (1990) Controlling mechanisms for H-O-S-C speciation of ore-forming fluids. Ann. Mtg. of Society of Mining Geologists, Tokyo. Mining Geology, **40**, p. 69.

108. Kitakaze, A., Graham, U., and Ohmoto, H. (1990) Relationships between mineralogical properties and formational mechanisms of pyrite. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p.86.

109. Hayashi, K. and Ohmoto, H. (1990) Study of reaction kinetics between mineral and solution. III. Barite and NaCl-H2O hydrothermal solutions. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p.87.

110. Kabamoto, J., Kitakaze, A., and Ohmoto, H. (1990) Mineralogy and textures of Archean volcanoenic massive sulfide deposits at Noranda, Canada. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p.107.

111. Morimoto, K., Kitakaze, A., Urabe, T., and Ohmoto, H. (1990) Variations in mineralogy and textures of ores from the Izena deposit, the Okinawa Trough. Program with Abstract, Joint Ann. Mtg. of Mineralogy-Related Societies, p.144

112. Kakegawa, T. and Ohmoto, H. (1990) Migration of heavy metals in the footwall volcanic rocks of volcanogenic massive sulfide deposits in the Noranda district, Canada. J. of Mineralogy, Petrology and Economic Geology

113. Hayashi, K. and Ohmoto, H. (1990) Mechanisms of transportation and precipitation of gold as estimated from solubility data. J. of Mineralogy, Petrology and Economic Geology

114. Albrecht, W., Poulson, S.R., and Ohmoto, H. (1990) A two stage model for the formation of a seal zone in the Appalachian Basin. Program with Abstracts, V.M. Goldschmidt Conference, Baltimore, Md. p. 28.

115. Graham, U.M., Barnes, H.L., and Ohmoto, H. (1990) The effects of elemental sulfur (S˚) on the kinetic pathways of FeS2 formation at low pH. Program with Abstracts, V.M. Goldschmidt Conference, Baltimore, Md. p. 28.

116. Poulson, S.R., Albrecht, W., Ohmoto, H., and Engelder, T. (1990) Stable isotope and geochemical characteristics of an ancient seal zone in the Appalachian Basin. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., Dallas, Texas. A-62.

117.Ohmoto, H. Kajisa, Y., and Hayashi, K. (1990) Solubilities of Fe-S-O minerals in NaCl-bearing aqueous solutions at 250˚ to 350˚C. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., Dallas, Texas. A-156-157.

118. Hayashi, K. and Ohmoto, H. (1990) Solubility of gold in H2S and NaCl-bearing aqueous solutions at 250˚ to 350˚C. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., Dallas, Texas. A-157.

119. Kakegawa, T. and Ohmoto, H. (1990) Heavy metal chemistry of volcanic rocks associated with Archean massive sulfide deposits in the Noranda district, Canada. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., Dallas, Texas. A-148.

120. Kitakaze, A., Graham, U.M., and Ohmoto, H. (1990) Anisotropy, crystal structure, density, and S/Fe ratios of hydrothermal pyrites: Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., Dallas, Texas. A-362.

121. Graham, U.M. and Ohmoto, H. (1991) Relationships between formational mechanisms and properties of pyrite crystals synthesized at 150 to 350 ˚C. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., San Diego, CA. A-211-212.

122. Albrecht, W., Poulson, S.R., and Ohmoto, H. (1991) Textural, chemical, and stable isotope evidence for diagenetic pressure seal formation, Deep Tuscaloosa Trend, Louisiana. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., Dallas, Texas. A-222.

123. Kakegawa, T., Michlik, M.M., Ohmoto, H., and Lowe, D.R. (1991) Laser-ablation micro sulfur isotope analyses of pyrite crsytals in sedimentary rocks of the ~3.4 b.y. old Fig Tree Group, South Africa. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., San Diego, CA. A-262.

124. Haruna, M. and Ohmoto, H. (1991) Mineralogy and fluid inclusion and stable isotope studies of the skarn-type ores at the Tengumori copper deposit of the Kamaishi mine, northeastern Japan. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., San Diego, CA. A-293.

125. Poulson, S.R., Schoonen, M.A., and Ohmoto, H. (1991) Oxygen isotope fractionation between free water and hydration sphere water in NaCl solutions from 100 degrees to 300 degrees centigrades. Abstract with Programs, Geol. Soc. of America, Ann. Mtgs., San Diego. A-320.

126. Ohmoto, H., Graham, U., Kitakaze, A. (1991) Relationships between formational mechanisms and properties of hydrothermal pyrite. Program with Abstracts, Joint Ann. Mtg. of Mineralogy-Related Societies, Sendai, Japan, p. 5.

127. Morimoto, K., Kitakaze, A., and Ohmoto, H. (1991) Influence of trace elements on the semiconductivity and cell constants of pyrite crystals. Program with Abstracts, Joint Ann. Mtg. of Mineralogy-Related Societies, Sendai, Japan, p. 94.

128. Mizukami, M., Ohmori, S., and Ohmoto, H. (1991) Geochemical parameters that control the compositions of hydrothermal sulfides. Program with Abstracts, Joint Ann. Mtg. of Mineralogy-Related Societies, Sendai, Japan, p.15.

129. Haruna, M. and Ohmoto, H. (1991) Carbon and oxygen isotopic compositions of minerals at the Tengumori deposit, Kamaishi mine. Program with Abstracts, Joint Ann. Mtg. of Mineralogy-Related Societies, Sendai, Japan, p.61.

130. Yamaguchi, H., Yamada, R. and Ohmoto, H. (1991) Hydrothermal circulation and migration of basemetals in the footwall rocks of the Fukazawa deposit. Program with Abstracts, Joint Ann. Mtg. of Mineralogy-Related Societies, Sendai, Japan, p.43.

131. Kabamoto, J. and Ohmoto, H. (1991) Mineralogy and textures of ores from Archean massive sulfide deposits, Ansil Mine, Canada: Program with Abstracts, Joint Ann. Mtg. of Mineralogy-Related Societies, Sendai, Japan, p.45.

132. Ohmoto, H. and Hayashi, K. (1991) Geochemistry of Fe in hydrothermal fluids. Ann. Mtg. of Society of Mining Geologists, Tokyo, Japan: Mining Geology, **41**, p. 192-193.

134. Graham, U. and Ohmoto, H. (1992) Formational mechanisms of framboidal pyrite on sulfur surfaces. V.M. Goldschmidt Conference, Reston, Va., Abstract with Programs, A-44.

135. Ohmoto, H., Hayashi, K., and Kajisa, Y. (1992) Solubilities of iron-sulfides and -oxides in water and chloride-bearing aqueous solutions at 250˚C to 350˚C. V.M. Goldschmidt Conference, Reston, Va., Abstract with Programs, A-78-79.

136. Naraoka, H., Hanamuro, T., Ohtake, M., Hayashi, K., Maruyama, S., Ohmoto, H., and Rosing, M. (1992) Geochemistry of Archean sedimentary rocks: I. Clues to the PO2 of the Archean atmosphere. V.M. Goldschmidt Conference, Reston, Va., Abstract with Programs, A-75.

137. Ohmoto, H., Hanamuro, T., Ohtake, M., Hayashi, K., Naraoka, H., Maruyama, S., Kakegawa, T., and Haruna, M. (1992) Geochemistry of Archean sedimentary rocks. II. The Red Sea model for formation of cherts and banded iron formations in Archean oceans. V.M. Goldschmidt Conference, Reston, Va., Abstract with Programs, A-78.

138. Ohmoto, H. (1992) Archean surface environments. Part I. Constraints from the major and trace element geochemistry of Archean shales and sandstones. The 29th International Geological Congress, Abst. **1**, 171.

139. Naraoka, H. and Ohmoto, H. (1992) Archean surface environments. Part II. Constraints from the sulfur, carbon and uranium geochemistry of Archean shales. The 29th International Geological Congress, Abst. **1**, 171.

140. Hanamuro, T., Naraoka, H., Hayashi, K., Kojima, S., haruna, M., and Ohmoto, H. (1992) Archean surface environments. Part III. Geochemistry of ~3.5 to ~2.5 Ga sedimentary rocks from the Pilbara-Hamersley district, Australia. The 29th International Geological Congress, Abst. **1**, 173.

141. Ohtake, M., Naraoka, H., Hayashi, K., Ohmoto, H., Maruyama, S., and Rosing, M. (1992) Archean surface environments. Part IV. Geochemistry of ~3.8 Ga metasediments from the Isua disrict, West Greenland. The 29th International Geological Congress, Abst. **1**, 173.

142. Kakegawa, T., Ohmoto, H., and Lowe, D.R. Archean surface environments. Part V. Activity of sulfate-reducing bacteria in oceans as indicated by the d34S values of individual yrite crystals in sedimentary rocks from the Barberton Mountain district, South Africa. The 29th International Geological Congress, Abst. **1**, 173.

143. Chu, X. and Ohmoto, H.(1992) The role of polysulfides and the mechanism of isotopic exchanges in aqueous sulfide-thiosulfate system. The 29th International Geological Congress, Abst. **1**, p. 201.

144. Morimoto, K. and Ohmoto, H. (1992) Semiconductivity, lattice parameter, optical anisotropy, and trace element geochemistry of natural pyrite crystals. The 29th International Geological Congress, Abst. **3**, p. 697.

145. Hayashi, K. and Ohmoto, H. (1992) In situ observation of fluid-mineral reactions for determination of dissolution/growth kinetics and solubilities of minerals under hydrothermal condtions. The 29th International Geological Congress, Abst. **3**, 762.

146. Kabamoto, J., Ohmoto, H. and Riverin, G. (1992) Development of magnetite ores in a massive sulfide body of the Ansil mine, Noranda district, Quebec, Canada. The 29th International Geological Congress, Abst. **3**, p. 792.

147. Haruna, M. and Ohmoto, H. (1992) Fluid inclusion and isotopic evidence for the hydrothermal origin of the banded iron formations in the Hamersley Basin, western Australia. Abstract with Programs, Geol. Soc. Amer. Ann. Mtgs., Cincinati. A-167-168.

148. Ohmoto, H. (1993) The banded iron formations in the Hamesley Basin, Australia: products of the oxygen-rich Archean atmosphere? Abstracts with Programs, Geol. Soc. Amer. Ann. Mtgs., Boston, A-89.

149. Ohmoto, H., Murata, R., Hayashi, K., Naraoka, H., and Maruyama, S. (1993) Formational processes of the banded iron formations as deduced from the rock textures and compositions. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo; J. of the Soc. of Resource Geol., **43**, 220-221.

150. Ohtake, M., Tanaka, H. and Ohmoto, H. (1993) Estimation of the regional metamorphic conditions in the Isua district, Greenland. Joint Ann. Mtg. of Mineralogy-Related Societies, Yamagata, Japan, p.43.

151. Kakegawa, T. and Ohmoto, H. (1993) Micro sulfur isotope analyses by the laser-ablation method. Joint Ann. Mtg. of Mineralogy-Related Societies, Yamagata, Japan, p.42.

152. Uyeda, K., Fujimaki, H., and Ohmoto, H. (1994) Sr and Nd isotope geochemistry of Mt. McRae Shale from Hamersley basin, Australia. Ann. Mtg. of Japan Assoc. of Mineralogists, Petrologists and Economic Geologists, Kyoto, Japan. J. of Mineralogy, Petrology and Economic Geology, **89**, p. 147.

153. Manaka, M. and Ohmoto, H. (1994) Dissolution model of uraninite and calculation of its dissolution rate. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p.422.

154. Naraoka, H., Hayashi, K. and Ohmoto, H. (1994) Chemical and isotopic composition of Mount McRae Shale, Hamersley district, Western Australia, and its implication to depositional environment. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p.422.

155. Kakegawa, T., Kawai, H. and Ohmoto, H. (1994) Mt. McRae Shale, Hamersley district, Australia: Constraints from the sulfur isotope compositions, and the S and C contents. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p.423.

156. Watanabe, Y., Naraoka, H., Hayashi, K., Ohmoto, H., and Condie, K.C. (1994) Geochemistry of carbon and sulfur of shales from the Kaapvaal Craton, South Africa. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p.423.

157. Nedachi, M., Ohmoto, H., and Kakegawa, T. (1994) Sulfur isotope analyses of sulfates by the Nd-YAG laser ablation method. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p.424.

158. Iwata, Y., Hayashi, K. and Ohmoto, H. (1994) Oxygen isotope analyses of sulfate minerals by the Nd:YAG laser ablation method. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p.424.

159. Liu, Y., Hayashi, K. and Ohmoto, H. (1994) Laser microprobe analyses of carbon and oxygen isotopes of carbonate. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p.425.

160. Hayashi, K., Fujisawa, H., Ohmoto, H., and Holland, H.D. (1994) Geochemistry of Proterozoic (~1.9 Ga) sedimentary rocks from the Labrador district, Canada. Abst., Japan Earth and Planetary Science Joint Mtg, Sendai, Japan, p. 425.

161. Hayashi, K. and Ohmoto, H. (1994) Inorganic geochemistry of Archean sedimentary rocks: Clues to the Po2 in the Archean Atmosphere. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.273.

162. Naraoka, H., Watanabe, Y., and Ohmoto, H. (1994) Organic geochemistry of Archean sedimentary rocks. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.273 - 274.

163. Kakegawa, T., and Ohmoto, H. (1994) Sulfur isotope geochemistry of Archean sedimentary rocks. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.274.

164. Ohmoto, H. (1994) Geochemistry cycles of H, O, C, S, and heavy metals in the early Earth. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.274.

165. Ohtake, M., Ohmoto, H., and Rosing, M. (1994) Metamorphic history of the 3.8 Ga Isua supracrustal belt, Greenland. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.282.

166. Kassai, N., Ohmoto, H., Lowe, D.R., and Condie, K.C. (1994) Geochemistry of Archean and Proterozoic sedimentary and igneous rocks. I. Inorganic geochemistry of sedimentary rocks from the Kaapvaal Craton, South Africa. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.282 - 283.

167. Watanabe, Y., Naraoka, H., Ohmoto, H., and Condie, K.C. (1994) Geochemistry of Archean and Proterozoic sedimentary and igneous rocks, II. C, N, S geochemistry of shales from the Kaapvaal Craton, South Africa. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.283.

168. Hanamuro, T., Kumazawa, K, Kassai, N., Hayashi, K., and Ohmoto, H. (1994) Geochemistry of Archean and Proterozoic sedimentary and igneous rosks. III. Inorganic geochemistry of sedimentary rocks from the Pilbara-Hamersley district, Western Australia. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.283.

169. Hayashi, K., Fujisawa, H., Ohmoto, H., and Holland H.D. (1994) Geochemistry of Archean Proterozoic sedimentary and igneous rocks. IV. Proterozoic (~1.9 Ga) sedimentary rocks from the Labrador district, Canada. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of he Soc. of Resource Geol., **44**, p.283 - 284.

170. Kakegawa, T., Aiba, K., and Ohmoto, H. (1994) Geochemistry of Archean and Proterozoic sedimentary and igneous rocks. V. Petrochemistry of igneous rocks from the Pilbara-Hamersley district, Western Australia. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.284.

171. Naraoka, H., Hayashi, K., and Ohmoto, H. (1994) Biological activities and hydrothermal activity records in the ~2.5 Ga Mount McRae Shale, Hamersley District, Western Australia. I. Mineralogy, major elements, trace elements and CHNS contents. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.284.

172. Kakegawa, T., Kawai, H., and Ohmoto, H. (1994) Biological activities and hydrothermal activity records in the ~2.5 Ga Mount McRae Shale, Hamersley Distict, Western Australia. II. Sulfur isotopic composition of pyrites. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.284 - 285.

173. Haruna, M., and Ohmoto, H. (1994) Biological activities and hydrothermal activity records in the ~2.5 Ga Mount McRae Shale, Hamersley Distict, Western Australia. III. Fluid inclusions and oxygen isotopes. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.285.

174. Uyeda, K., Fujimaki, H., and Ohmoto, H. (1994) Biological activities and hydrothermal activity records in the ~2.5 Ga Mount McRae Shale, Hamersley Distict, Western Australia. IV. Rb-Sr and Nd-Sm isotope systematics. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.285.

175. Kanno, A., Murata, R, Kakegawa, T., and Ohmoto, H. (1994) Fe and Mn geochemistry of the Brockman Iron Formation, Western Australia. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.285 - 286.

176. Iwata, Y., Hayashi, K., Higashida, M., Kurai, H., and Ohmoto, H. (1994) Sulfur isotope geochemistry of Archean sedimentary rocks. I. Barites from the ~3.4 - 3.2 Ga Fig Tree Group, South Africa, and from the ~3.5 Ga Warawoona Group, Western Australia. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.286.

177. Hayashi, K., Kasahara, Y., and Ohmoto, H. (1994) Sulfur isotope geochemistry of Archean sedimentary rocks. II. Pyrites in shales from the Pilbara-Hamersley district, Western Australia. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.286.

178. Liu, Y., Hirota, M., Hayashi, K., Naraoka, H., and Ohmoto, H. (1994) Carbon and oxygen isotopic compositions of carbonates in Archean sedimentary rocks from the Pilbara-Hamersley district, Western Australia. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.286 - 287.

179. Kassai, N., Hayashi, K., and Ohmoto, H. (1994) Po2 and Pco2 values of the atmosphere and iron geochemistry of modern and paleo soils. I. Modern soils. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.287.

180. Ohmoto, H. and Hayashi, K. (1994) Po2 and Pco2 values of the atmosphere and iron geochemistry of modern and paleo soils. II. Paleosols. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.287.

181. Manaka, M. and Ohmoto, H. (1994) Incongruent dissolution model of uraninite and its application to the Po2 problem of Archean atmosphere. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geol., **44**, p.287.

182. Samieyani, A. and Ohmoto, H. (1994) Mineralogy and geochemistry of ~3.5 Ga volcanogenic massive sulfide deposits at the big Stubby prospect, the Pilbara district, Western Australia. Joint Ann. Mtg. of Mineralogy-Related Societies, Matsumoto, Japan, Abstracts with Programs, p. 92.

183. Hayashi, K. and Ohmoto H. (1994): Evolution of continental crust: Evidences from chemistry of sedimentary rocks. Joint Ann. Mtg. of Mineralogy-Related Societies, Matsumoto, Japan, Abstracts with Programs, p. 91.

184. Ohmoto, H., Naraoka, H., Watanabe, Y., and Hayashi, K. (1994) Carbon isotope records suggesting formations of large anoxic basins 2.8-2.5 Ga ago. Abstracts with Programs, Geol. Soc. Amer. Ann. Mtgs., Seattle, A-353.

185. Ohmoto, H. (1994) Submarine hydrothermal systems: from Kuroko to banded iron formations. Abstract volume 37, 12th Asutralian Geological Convention, Perth, 26-30 September 1994, p. 324.

186. Ohmoto, H. (1995) Evidence in paleosols for the early evolution of the atmospheric oxygen and terrestrial biota. Program and Abstract, V.M. Goldschmidt Conference, State College, Pa., Abstract with Programs, p. 76.

187. Watanabe, Y., Naraoka, H., Ohmoto, H., and Condie, K.C. (1995) C, N, S and U geochemistry of 3.0 - 2.1 Ga shales from the Kaapvaal Craton, South Africa. Program and Abstract, V.M. Goldschmidt Conference, State College, Pa., Abstract with Programs, p. 95.

188. Ohmoto, H., Hayashi, K., Kassai, N., and , and Hanamuro, T. (1995) Behaviors of elements during diagenesis and hydrothermal alteration of shales: I. Fe, Si, Al, Ti, and alkali elements. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 257.

189. Hayashi, K. Watanabe, Y., Manaka, M., and Ohmoto, H. (1995) Behaviors of elements during diagenesis and hydrothermal alteration of shales: II. Uranium. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 257.

190. Watanabe, Y., Liü, Y., Naraoka, H., and Ohmoto, H. (1995) Behaviors of elements during diagenesis and hydrothermal alteration of shales: III. C, N, S, and P: Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 258.

191. Kakegawa, T., Haruna, M., Hayashi, K., and Ohmoto, H. (1995) Behaviors of elements during diagenesis and hydrothermal alteration of shales: IV. Formational mechanisms of pyrite nodules. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 258.

192. Kakegawa, T. and Ohmoto, H. (1995) ~3.4 Ga biogenic pyrites and ~3.1 Ga hydrothermal pyries at the Princeton gold mine, Barberton, South Africa: Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 253.

193. Liü, Y., Hayashi, K., and Ohmoto, H. (1995) Carbon isotopic composition of kerogen in the Marra Mamba Iron Formation from the Hamersley Basin, Western Australia. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 253.

194. Kumazawa, K., Sato, H., Kakegawa, T., Hayashi, K., and Ohmoto, H. (1995) Formational processes of dolomites in the Wittenoom Formation, the Hamersley district, Western Australia and the environment 2.6 billion year ago. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 254.

195. Manaka, M., Tsukamoto, K., and Ohmoto, H. (1995) Impurity effects on dissolution rates of uraninite in aqueous solutions. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 254.

196. Ohmoto, H. (1995) Genetic relationships between black shales and submarine hydrothermal ore deposits. Abst., Ann. Mtg. of Soc. of Resource Geology, Tokyo. J. of the Soc. of Resource Geology, **45**, p. 259.

197. Nedachi, Y., Nedachi, M., and Ohmoto, H. (1995) Weathering of granite 2.3-2.4 Ga at Pronto, Ontario, Canada. Ann. Mtg. of Japan Assoc. of Mineralogists, Petrologist and Economic Geologists, Matsumoto, Japan, Abstracts with Programs, p. 76.

198. Nedachi, M., Masushige, K., Nedachi, Y., and Ohmoto, H. (1995) Ann. Mtg. of Japan Assoc. of Mineralogists, Petrologist and Economic Geologists, Matsumoto, Japan, Abstracts with Programs, p. 77.

199. Samieyani, A., Hayashi, K., and Ohmoto, H. (1996) Constructions on the chemistry of ~3.5 Ga seawater from volcanogenic massive sulfide deposits at Big Stubby Prospect, the Pilbara district, western Australia. Japan Earth and Planetary Science Joint Meeting, Osaka, Japan, Abstracts with Programs, p. 31.

200. Kumazawa, K. and Ohmoto, H. (1996) The origins of carbonates in the ~2.6 Ga Wittenoon Formation, western Australia. Japan Earth and Planetary Science Joint Meeing, Osaka, Japan, Abstracts with Programs, p. 30.

201. Manaka, M., Tsukamoto, K., and Ohmoto, H. (1996) Study of uraninite dissolution mechanism (in Japanese). Japan Earth and Planetary Science Joint Meeting, Osaka, Japan, Abstracts with Programs, p. 31.

202. Nedachi, Y., Nedachi, M., and Ohmoto, H. (1996) Weathering of granite of the Archean-Proterozoic boundary, Pronto, Ontario, Canada. Japan Earth and Planetary Science Joint Meeting, Osaka, Japan, Abstracts with Programs, p. 32.

203. Nedachi, M., Masushige, K., Nedachi, Y., and Ohmoto, H. (1996) The sedimentation environments fo the uraniferous conglomerates of the Archean-Proterozoic boundary. Japan Earth and Planetary Science Joint Meeing, Osaka, Japan, Abstracts with Programs, p. 33.

204. Kakegawa, T. and Ohmoto, H. (1996) Biogenic pyrite foration in Archean sedimentary rocks and its environments. Japan Earth and Planetary Science Joint Meeting, Osaka, Japan, Abstracts with Programs, p. 252.

205. Watanabe, Y., Liü, Y., Naraoka, H., and Ohmoto, H. (1996) Biological activity and chemical environments of the Archean and early Proterozoic oceans as indicated by the chemical and isotopic compositions of organic matter. Japan Earth and Planetary Science Joint Meeting, Osaka, Japan, Abstracts with Programs, p. 253.

206. Ohtake, M. and Ohmoto, H. (1996) Fluid-mineral reactions during metamorphism in the Isua supracrustal belt, Greeenland. Japan Earth and Planetary Science Joint Meeing, Osaka, Japan, Abstracts with Programs, p. 505.

207. Sato, H., Tsukamoto, K., and Ohmoto, H. (1996) Applications of oxygen isotope micro-analysis by using a CO2 laser microscope (in Japanese). Japan Earth and Planetary Science Joint Meeing, Osaka, Japan, Abstracts with Programs, p. 574.

208. Suzuki, A., Watanabe, Y., Kakegawa, T., and Ohmoto, H. (1996) Changes in chemical and isotopic compositions of organic matters in sedimentary rocks during thermal alteration. Abst. with Programs Ann. Mtg. Soc. Resource Geol., Tokyo, Japan.

209. Shibasaki, T., Watanabe, Y., Kakegawa, T., and Ohmoto, H. (1996) Influence of hydrothermal activity on biological activity in the Red Sea. Abst. with Programs Ann. Mtg. Soc. Resource Geol., Tokyo, Japan.

210. Ohmoto, H., Watanabe, Y., Kakegawa, T., and Hayashi, K., (1996) The atmospheric oxygen budget through geological time. Abst. with Programs Ann. Mtg. Soc. Resource Geol., Tokyo, Japan.

211. Nedachi, M., Matsumura, K., Miura, T., Shimada, K., Kakegawa, T., and Ohmoto, H. (1996) Sulfur behavior in the Aira caldera, Kagoshima, Japan. Abst. with Programs Ann. Mtg. Soc. Resource Geol., Tokyo, Japan.

212. Watanabe, Y., Suzuki, A., and Ohmoto, H. (1996) Thermal alteration of organic matter in oil shales; Chemical and isotopic effects. Abst. with Programs Geol. Soc. Am. Ann. Mtgs., Denver, CO, A-28.

213. Ohmoto, H. (1996) Evidence in pre-2.2 Ga paleosols and shales of the early development of an oxic atmosphere and terrestrial biosphere. Abst. with Programs Geol. Soc. Am. Ann. Mtgs., Denver, CO.

214. Shibasaki, T., Watanabe, Y., Kakegawa, T., and Ohmoto, H. (1997) Accelerated accumulation of organic matter during intense hydrothermal activity: Influence of submarine hydrothermal activity on the primary productivity. Abst. with Programs Japan Earth Planet. Sci. Joint Mtg., Nagoya, Japan.

215. Watanabe, Y., Martini, J.E.J., and Ohmoto, H. (1997) Origin of organic matter and carbonates in a 2.6 Ga paleosol section in the eastern Transvaal, South Africa. Abst. with Programs Japan Earth Planet. Sci. Joint Mtg., Nagoya, Japan.

216. Yamaguchi, K. and Ohmoto, H. (1997) Ferric and ferrous contents of marine sediments: indicator of the atmospheric PO2 level and paleotectonic setting. Program and Abstract, V.M. Goldschmidt Conference, Tucson, Arizona, 224p.

217. Mock, R.L. and Ohmoto, H. (1997) Nondetrital origins of uranium-bearing minerals and pyrites in early Proterozoic quartz-pebble conglomerates of the Elliot Lake district, Ontario. Program and Abstract, V.M. Goldschmidt Conference, Tucson, Arizona, 224p.

218. Watanabe, Y. and Ohmoto, H. (1997) Deverscations of organisms and redox environments of Archean ocean: evidence from carbon isotopic composition of organic matter from 2.8 to 2.5 Ga sedimentary rocks. Abst. with Programs Geol. Soc. Am. Ann. Mtgs., Salt Lake City, UT., A-116.

219. Ohmoto, H. (1997) Systematics of banded iron formations: Abst. with Programs Geol. Soci. Am. Ann. Mtgs., Salt Lake City, UT, A-444.

220. Ohmoto, H. (1997) Causes for variations in types of banded iron formations. Abst. with Programs Ann. Mtg. Soc. Resource Geol., Tokyo, Japan.

221. Ohmoto, H. (1997) Migration of uranium and thorium in geologic formations: Abst. with Programs for the Sixth International Conference on the Chemistry and Migration Behaviour of Actinides and Fission Products in the Geosphere, Sendai, Japan.

222. Kakegawa, T., Omata, T., and Ohmoto, H. (1997) Sulfur isotope geochemistry of the late Proterozoic sedimentary rocks from the Newfoundland in Canada, and its implication to the surface environment. Abst., Japan Earth & Planet. Sci., Joint Mtg., Nagoya, Japan, p. 204.

223. Samieyani, A. and Ohmoto, H. (1997) Correlation of d13C excursions across the Precambrian/Cambrian boundary between Iranian and Siberian sections. Abst., Japan Earth & Planet. Sci., Joint Mtg., Nagoya, Japan, p. 196.

224. Hiramatsu, K., Hayashi, K., Kakegawa, T., and Ohmoto, H. (1997) Geochemistry of sedimentary rocks of the Precambrian/Cambrian stratotype from the Chapel Island Formation, Canada, and constraints on the redox conditions of surface environments. Abst., Japan Earth & Planet. Sci., Joint Mtg., Nagoya, Japan, p. 194.

225. Watanabe, Y., Martini, J.E.J., and Ohmoto, H. (1997) Origins of organic matter and carbonates in a 2.6 Ga paleosol section in the Eastern Transvaal, South Africa. Abst., Japan Earth & Planet. Sci., Joint Mtg., Nagoya, Japan, p. 218.

226. Chu, X., Li, R., and Ohmoto, H. (1997) Sulfur isotope geochemistry of the late Proterozoic Yangtze Block in China and constraints on the surface environment of the Proterozoic Earth. Abst., Japan Earth & Planet. Sci., Joint Mtg., Nagoya, Japan, p. 217.

227. Ono, S., Mock, R., and Ohmoto, H. (1998) Origins of uraninites in early Proterozoic quartz-pebble conglomerates of the Elliot Lake district, Ontario, Canada. Abstracts with Programs, the Annual Meeting of the Geological Society of America, Toronto, Canada, October, 1998, A290.

228. Ohmoto, H. (1998) Evidence in trace elements and Fe3+/Fe2+ ratios of Archean and early Proterozoic shales for the early development of oxic atmosphere. *Mineralogical Magazine*, **62A**, 1106-1107.

229. Kakegawa, T. and Ohmoto, H. (1998) High activity of sulphate-reducing bacteria in Archean and Proterozoic oceans and an early development of the Phanerozoic-style sulfur cycles. *Mineralogical Magazine*, **62A**, 738-739.

230. Nedachi, M., Yamanouchi, H., and Ohmoto, H. (1998) Detrital and hydrothermal origins for quartz, pyrite, and uraninite in Au-U-rich conglomerates of the Witwatersrand gold field, South Africa. *Mineralogical Magazine*, **62A**, 1060-1061.

231. Nedachi, Y., Nedachi, M., Bennett, G., and Ohmoto, H. (1998) Weathering of granite under an O2- and CO2-rich atmosphere 2.45 Ga at Pronto, Ontario, Canada. *Mineralogical Magazine*, *62A*, 1062-1063.

232. Ono, S., Mock, R., and Ohmoto, H. (1998) Two-fluids (oxic and reduced) model for the formation of uraninite in early Proterozoic quartz-pebble conglomerates of the Elliot Lake district, Ontario, Canada. *Mineralogical Magazine*, **62A**, 1110-1111.

233. Watanabe, Y., Martini, J.E.J., and Ohmoto, H. (1998) Origins of carbonates and organic matter in a 2.6 Ga paleosol section at Schagen, Eastern Transvaal, South Africa: Mineralogical Magazine, V.62A, 1635-1636.

234. Yamaguchi, K.E., Ono, S., and Ohmoto, H. (1998) Diverse origins of pyrites in Paleoproterozoic uraniferous quartz-pebble conglomerates, Elliot Lake, Canada: Evidence from laser-microprobe sulphur isotope analyses. *Mineralogical Magazine*, **62A**, 1673-1674.

235. Ohmoto, H. (1999) Does siderite constrain the pCO2 and pO2 levels of the Archean atmosphere? Abstract Volume, Ninth Annual V.M. Goldschmidt Conference, August 22-27, 1999, Harvard Univ., Cambridge, Mass. 215-216.

236. Ohmoto, H. (1999) The formation of laterites ~2.3 billion years ago. Abstracts with Programs, 1999 Annual Meeting and Exposition, Denver, Colorado, October 25-28, A225-226.

237. Ono, S., Fayek, M., and Ohmoto, H. (1999) The origin of detrital uraninite in the Elliot Lake district: An ion microprobe study of individual uraninite grains. Abstracts with Programs, 1999 Annual Meeting and Exposition, Denver, Colorado, October 25-28, A-69.

238. Kakegawa, T., Iwakiri, K., and Ohmoto, H. (1999) Geochemistry of the 2.0 Ga RoveFormation, Canada suggests an early establishment of the modern style elemental cycles mediated by biological activities. Abstracts with Programs, 1999 Annual Meeting and Exposition, Denver, Colorado, October 25-28, A-106.

239. Stewart, B.W., Capo, R.C., Watanabe, Y., and Ohmoto, H. (1999) Provenance of a 2.6 Ga terrestrial carbonate sequence from the Eastern Transvaal region, South Africa. EOS, Transactions, AGU Volume 80, No. 46, November 16, 1999, F69-70.

240. Watanabe, Y., Martini, J.E.J., and Ohmoto, H. (1999) 2.6 Ga remnants of O2-producing terrestrial biomats in the Eastern Transvaal distrct, South Africa. EOS, Transactions, AGU Volume 80, No. 46, November 16, 1999, F71.

241. Stafford, S.L., Capo, R.C., Stewart, B.W., Macpherson, G.L., and Ohmoto, H. Micromorphology and geochemistry of an apparent Archean weathering profile, Ontario, Canada. EOS, Transactions, AGU Volume 80, No. 46, November 16, 1999, F1167.

242. Ohmoto, H., Watanabe, Y., Yamaguchi, K., Ono, S., Hayashi, K., Naraoka, H., Nedachi, M., and Nedachi, Y. (2000) Geochemical evidence for the early development of an oxygenated atmosphere and terrestrial biomass. Abstract Volume, First Astrobiology Science Conference, April 3-5, 2000, p. 291.

243. Watanabe, Y. and Ohmoto, H. (2000) Carbon isotopic compositions of organisms lived in a submarine hydrothermal brine pool and in a freshwater lake 2.7 billion years ago. Abstract Volume, First Astrobiology Science Conference, April 3-5, 2000, p. 295.

244. Yamaguchi, K.E., Ohmoto, H., and Bau, M. (2000) Geochemistry of rare earth elements in Precambrian banded iron formations: are the Ce anomalies real? Abstract Volume, First Astrobiology Science Conference, April 3-5, 2000, p. 296.

245. Lasaga, A.C. and Ohmoto, H. (2000) Modeling the evolution of oxygen in the Earth atmosphere. Abstract Volume, First Astrobiology Science Conference, April 3-5, 2000, p. 303.

246. Ono, S. and Ohmoto, H. (2000) Constraints on the oxygenlevel of the Archean atmosphere based on new data on dissolution rates of uraninite: Abstract Volume, First Astrobiology Science Conference, April 3-5, 2000, p. 304.

247. Lasaga, A.C. and Ohmoto, H. (2000) Modeling the dynamics, stability, and evolution of oxygen and carbon dioxide in the atmosphere. Abst. With Program, 2000 GSA Annual Meeting, Reno, Nevada, A-345, Nov. 2000.

248. Stafford, S.L., Stewart, B.W., Capo, R.C., and Ohmoto, H. (2000) Neodymium isotope investigation of an Archean weathering profile: Steep Rock paleosol, Ontario, Canada. Abst. With Program, 2000 GSA Annual Meeting, Reno, Nevada, A-485, Nov. 2000.

249. Nedachi, M., Nedachi, Y., and Ohmoto, H. (2000) Geochemical history of the sericite-chlorite zones in the 2.8 Ga Mount Roe basalt, Pilbara, Australia. Abst. With Program, 2000 GSA Annual Meeting, Reno, Nevada, A-485, Nov. 2000.

250. Watanabe, Y. and Ohmoto, H. (2000) Ferric-bearing minerals and organic matter in the 2.8 Ga Schagen paleosol, East Transvaal, South Africa. Abst. With Program, 2000 GSA Annual Meeting, Reno, Nevada, A-485, Nov. 2000.

251. Marmo, Y.S. and Ohmoto, H. (2000) ~2.3 Ga paleolaterites in North Karelia, East Finland. Abst. With Program, 2000 GSA Annual Meeting, Reno, Nevada, A-486, Nov. 2000.

252. Macpherson, G.L., Stafford, S.L., Capo, Stewart, B.W., and Ohmoto, H. (2000) Geochemistry of an Archean paleosol, Steep Rock, Ontario, Canada: Whole rock and LAM-ICPMS analysis. Abst. With Program, 2000 GSA Annual Meeting, Reno, Nevada, A-485, Nov. 2000.

253. Ono, S. and Ohmoto, H. (2000) Constraints on the oxygen level of the Archean atmosphere based on new data on dissolution rates of uraninite. Abstract Volume, 2000 Fall Meeting, American Geophysical Union, San Francisco, Dec., 2000.

254. Lasaga, A.C. and Ohmoto, H. (2000) The oxygen geochemical cycle: dynamics, stability and evolution. Goldschmidt Conf. Sept., 2000, Oxford, UK, Journal of Conference Abstracts, v. 5 (2), p. 620.

255. Yamaguchi, K.E., Bau, M. and Ohmoto, H. (2000) Constraints from REEs on the processes and environments for Precambrian banded iron formations: re-evaluation of the data and models. Goldschmidt Conf. Sept., 2000, Oxford, UK, Journal of Conference Abstracts, v. 5 (2), p. 110.

256. Ohmoto, H. (2001) The evolution of O2 and CO2 in the atmosphere. General Meeting of the NASA Astrobiology Institute, Washington, D.C., April, 2001, Proceeding Volume, p. 231.

257. Ono, S. and Ohmoto, H. (2001) Dissolution kinetics of natural uraninite and the evolution of atmospheric oxygen. General Meeting of the NASA Astrobiology Institute, Washington, D.C., April, 2001, Proceeding Volume, p. 289.

256. Stafford, S.L., Capo, R.C., Stewart, B.W., Marmo, J., and Ohmoto, H. (2001) Neodymium isotope investigation of a Precambrian weathering profile: Hokkalampi paleosol, Northern Karelia, Eastern Finland. General Meeting of the NASA Astrobiology Institute, Washington, D.C., April, 2001, Proceeding Volume, p. 303.

259. Watanabe, Y. and Ohmoto, H. (2001) Development of cyanobacterial mats on soil surface under an oxygenated atmosphere 2.6 Gya ago at Schagen, Eastern Transvaal, South Africa. General Meeting of the NASA Astrobiology Institute, Washington, D.C., April, 2001, Proceeding Volume, p. 309.

260. Yamaguchi, K. and Ohmoto, H. (2001) Organic carbon, S, Mo, U, and V in Archean and Paleoproterozoic black shales. General Meeting of the NASA Astrobiology Institute, Washington, D.C., April, 2001, Proceeding Volume, p. 311

261. Ohmoto, H., Watanabe, Y., Yamaguchi, K.E., Ono, S., Bau, M., Kakegawa, T., Naraoka, H., Nedachi, M., and Lasaga, A.C. (2001) The Archean atmosphere, oceans, continents and life. Extended Abstract Volume, 4th International Archean Symposium, 24-28 September 2001, Perth, Western Australia, p. 19-21.

262. Naraoka, H., Kakegawa, T., and Ohmoto, H. (2001) C, S, and N isotope excursions of biogenic products in the 2.7 Ga Jeerinah Formation, Hamersley district, Western Australia. Extended Abstract Volume, 4th International Archean Symposium, 24-28 September 2001, Perth, Western Australia, p. 254-255.

263. Ohmoto, H. and Lasaga, A.C. (2001) Modeling the long-term evolution of atmospheric oxygen and carbon dioxide. Programmes with Abstracts, Earth System Processes, 24-28 June 2001, Edinburgh, Scotland, A global meeting preented by The Geological Society of America and The Geological Society of London, p. 62.

264. Ohmoto, H., Yamaguchi, K.E., Watanabe, Y., Naraoka, H., Kakegawa, T., and Lasaga, A.C. (2001). Geochemical evidence for oxygenated Archean oceans. Programmes with Abstracts, Earth System Processes, 24-28 June 2001, Edinburgh, Scotland, A global meeting preented by The Geological Society of America and The Geological Society of London, p. 64.

265. Yamaguchi, K., and Ohmoto, H. (2001) Molybdenum and organic carbon in Archean black shales: evidence for aerobic oceans. Programmes with Abstracts, Earth System Processes, 24-28 June 2001, Edinburgh, Scotland, A global meeting preented by The Geological Society of America and The Geological Society of London, p. 77.

266. Nedachi, M., Nedachi, Y., Koashi, M., and Ohmoto, H. (2001). Pyrophyllite – diaspore veins in the 2.7 Ga paleosols at Mount Roe, Pilbara, Australia: new evidence for the oxic Archean atmosphere. Programmes with Abstracts, Earth System Processes, 24-28 June 2001, Edinburgh, Scotland, A global meeting preented by The Geological Society of America and The Geological Society of London, p.77-78.

267. Watanabe, Y. & Ohmoto, H. (2001) Development of microbial mats during soil formation 2.6-2.3 Ga ago in Eastern Transvaal, South Africa. Programmes with Abstract, Earth System Processes, 24-28 June, 2001, Edinburgh, Scotland, A global meeting presented by The Geological Society of America and the Thegological Society of London, p. 77.

268. Ohmoto, H., Yamaguchi, K., and Ono, S. (2001) Mass-independent fractionation of sulfur isotopes in geologic samples: Is it real? Abst. 3133, Eleventh Annual V.M. Goldschmidt Conference, May 20-24, 2001, Hot Spring, Va., USA

269. Ohmoto, H. and Lasaga, A.C. (2001) Modelling the long-term evolution of atmospheric oxygen and carbon dioxide. Abst. 3189, Eleventh Annual V.M. Goldschmidt Conference, May 20-24, 2001, Hot Spring, Va., USA

270. Ohmoto, H. (2002) Banded iron formations indicate an oxygenated atmosphere-ocean system since ~3.8 Ga. Abstract Volume, Astrobiology Science Conference 2002, p.57.

271. Bazilevskaya, E. and Ohmoto, H. (2002) Do paleosols constrain the CO2 level of the Archean atmosphere? Abstract Volume, Astrobiology Science Conference 2002, p.138.

272. Stafford, S., Capo, R., Stewart, B., Marmo, J., and Ohmoto, H. (2002) Development of the Proterozoic-Archean Hokkalampi weathering profile, Eastern Finland. Abstract Volume, Astrobiology Science Conference 2002, p. 148.

273. Watanabe, Y., Yamaguchi, K., Naraoka, H., and Ohmoto, H. (2002) Episodic developments of anoxic basins in the late Archean, early Proterozoic oceans: evidence from C/P ratios of shales. Abstract Volume, Astrobiology Science Conference 2002, p. 152.

274. Yamaguchi, K., Naraoka, H., and Ohmoto, H. (2002) The nitrogen biogeochemical cycles in the Archean inferred from shale geochemistry. Abstract Volume, Astrobiology Science Conference 2002, p. 178.

275. Stafford S. L., Capo R. C., Stewart B. W. Marmo J, and Ohmoto H (2002) Paleoenvironmental investigation of the Proterozoic Hokkalampi paleosol, eastern Finland. *Geochim. Cosmochim. Acta* v. **66** no. S1, A 735.

276. Yamaguchi K., Naraoka H., Watanabe Y., Ohmoto H. (2002) The early evolution of the Archean nitrogen biogeochemical cycle. *Geochim. Cosmochim. Acta* v. **66** no. S1, A 857.

277. Yokoyama T., Bazilevskaya E., Watanabe Y., and Ohmoto H. (2002) Formation of ion (III)-silicic acid complexes as possible mechanism for the transport of iron in oxygenated natural water. Geological Society of America Abstracts with Programs **34**, no.6, 84-13.

278. Ohmoto H. (2002) banded iron formations as guides for the history of the lithosphere, atmosphere, and biosphere. Geological Society of America Abstracts with Programs **34**, no. 6, 125-9.

279. Yamaguchi, K. E. and Ohmoto, H. (2002) Molybdenum geochemical cycle in the Archean. Geological Society of America Abstracts with Programs **34,** no. 6, 169-3.

280. Watanabe Y. and Ohmoto H. (2002) The ecosystems in submarine hydrothermal environments of the Canadian shield 2.7 billion years ago. Geological Society of America Abstracts with Programs **34,** no. 6, 169-10.

281. Nedachi Y., Hidaka H., Nadachi M., and Ohmoto, H. (2002) The depletions and enrichments of Fe in the 2.7 Ga “Mt. Roe paleosols” were caused by reduced hydrothermal fluids. Geological Society of America Abstracts with Programs **34,** no. 6, 226-7.

282. Nedachi M., Nozaki J., and Ohmoto H. (2002) 2.76 Ga submarine hydrothermal system associated with life in the Mt. Roe basalt, Pilbara, Australia. Geological Society of America Abstracts with Programs vol. 34, no. 6, 226-8.

283. Ohmoto, H., Nedachi, M., Hickman, A.H., and Barley, M.E. (2002) The Archean Biosphere Drilling Project. Abstracts for NAI general mtg. *Astrbiology*, **2**, 503.

284. Ikemi, H., Ohmoto, H., nakamura, T., and Shimada, N. (2002) The origin of hematite crystals associated with Archean redbeds in the Lake Shebandowan area, Canada: A preliminary study from chemical compositions and oxygen isotopes. Abstracts for NAI general mtg. *Astrbiology*, **2**, 562.

285. Bazilevskaya, K., Yokoyama, T., and Ohmoto, H. (2002) Iron-silica complexation in aqueous solutions: A key to understanding the origin of banded iron formations. Abstracts for NAI general mtg. *Astrbiology*, **2**, 584.

286. Watanabe, Y. and Ohmoto, H. (2002) Ce anomalies in the 2.6-2.4 Ga Kalkkloof paleosol in South Africa: Evidence for the early oxygenated atmosphere. Abstracts for NAI general mtg. *Astrbiology*, **2**, 585.

287. Tamaguchi, Y.E. and Ohmoto, H. (2002) Uranium budget of the Archean oceans: Implications for the redox evolution of the atmosphere. Abstracts for NAI general mtg. *Astrbiology*, **2**, 585.

288. Ohmoto, H. (2003) Banded iron formations and the evolution of the atmosphere, hydrosphere, biosphere and lithosphere. *Applied Earth Science*, **112**, B161-162.

289. Ohmoto, H. (2003) Gast Lecture: Chemical and biological evolution of the early Earth; A minority report. *Geochimica et Cosmochimica Acta*, **67**, 18S, A2.

290. Ohmoto, H. and Watanabe, Y. (2003) Siderite in Archean sedimentary rocks: Evidence for a CO2-rich and CH4-poor atmosphere. *Geochimica et Cosmochimica Acta*, **67**, 18S, A351.

291. Watanabe, Y. and Ohmoto, H. (2003) Ce anomalies in the 2.6-2.4 Ga Kalkkloof paleosol in South Africa: Evidence for the early development of oxygenated atmosphere. *Geochimica et Cosmochimica Acta*, **67**, 18S, A528.

292. Yamaguchi, K.E., Beard, B.L., Johnson, C.M., Ohkochi, N., and Ohmoto, H. (2003) Iron isotope evidence for redox staritification of the Archean oceans. *Geochimica et Cosmochimica Acta*, **67**, 18S, A55

293. Ohmoto, H., Nedachi, M., Kato, Y., Bevaqua, D., and Watanabe, Y. (2004) An initial report of ABDP investigations: evidence of a high pO2, high pCO2 and low CH4 Archean atmosphere in the 3.45 Ga Marble Bar chert. *International J. of Astrobiology* Supplement 1, 13.

294. Kato, Y., Nakamura, K., Moriguchi, E., Imura, R., Nedachi, M., and Ohmoto, H. (2004) Preliminary report: the bulk-rock geochemistry of the 3.45 Ga Marble Bar chert (ABDP #1 site). *International J. of Astrobiology* Supplement 1, 13.

295. Nedachi, M., Ohmoto, H., Hickman, A., and Barley, M. (2004) Scientific objectives of the Archean Biosphere Drilling Project (ABDP). *International J. of Astrobiology* Supplement 1, 13.

296. Hoashi, M., M. Nedachi, Sugimura, Y., Niitsuma, S., Naraoka, H., Imura, R., and Ohmoto, H. (2004) An initial report of ABDP investigations; preliminary observations of iron oxides in the Marble Bar chert, Pilbara Craton, Western Australia. *International J. of Astrobiology* Supplement 1, 14.

297. Nedachi, Y., Nedachi, M., Kakegawa, T., Imura, R., and Ohmoto, H. (2004) An initial report of ABDP investigations: fluid inclusions in alteration zones of the 2.8 Ga Mount Roe basalt, Pilbara, Western Australia. *International J. of Astrobiology* Supplement 1, 15.

298. Watanabe, Y., Kumazawa, K., and Ohmoto, H. (2004) Evidence in carbon isotope ratios of siderites for a CO2-rich and CH4-poor Archean atmosphere and oceans. *International J. of Astrobiology* Supplement 1, 37-38.

299. Walden, K., Stewart, B., Watanabe, Y., and Ohmoto, H. (2004) Neodymium isotopic evolution of the Kalkloof paleosol, South Africa. *International J. of Astrobiology* Supplement 1, 38.

300. Otake, T., Watanabe, Y., and Ohmoto, H. (2004) “Detrital” pyrites in the Archean Witwatersrand Basin (South Adrica) are not detrital. *International J. of Astrobiology* Supplement 1, 38.

301. Ohmoto, H., Nedachi, M., Kato, Y., Bevacqua, D., and Yamaguchi, K. (2004) Evidence of a high-O2. high CO2 and low CH4 Archean atmosphere in the 3.46 Ga Marble Bar Chert, Western Australia. *Geochimica et Cosmochimica Acta* **68,** A783.

302. Watanabe, Y., Otake, T., Altermann, W., and Ohmoto, H. (2004) “Detrital” pyrite pebbles from Witwatersrand, South Africa: Evidence for an oxygenated Archean atmosphere? *Geochimica et Cosmochimica Acta* **68,** A788.

303. Naraoka, H., Watanabe, Y., Nedachi, M., and Ohmoto, H. 15N signatures of late Archean shales from two drilling cores, Hamersley, Western Australia. *Geochimica et Cosmochimica Acta* **68,** A789.

304. Yamaguchi, K., Johnson, C. M., Beard, B. L., and Ohmoto, H. Iron-sulfur-carbon contents and isotope systematics of 2.7 Ga shallow and deep facies black shales from the Hame4rsley Basin, Australia. *Geochimica et Cosmochimica Acta* **68,** A795.

305. Ohmoto, H., Bevacqua, D.C., Watanabe, Y., and Otake, T. (2004) Origins of carbonaceous matter, hematite, and pyrite in the 3.46 Ga Marble Bar chert/jasper/basalt formation, Pilbara, Western Australia. EOS, Transactions, American Geophysical Union, AGU Fall Meeting, v. 85, F353.

306. Yamaguchi, K.E., Hoashi, M., Tanimizu, M., Kakegawa, T., Nedachi, M., and Ohmoto, H. (2004) Iron isotope analses for the origin of Fe-bearing minerals in the 3.46 Ga Marble Bar Chert, Pilbara Craton, Western Australia, recovered by Archean Biosphere Drillin Project (ABDP). EOS, Transactions, American Geophysical Union, AGU Fall Meeting, v. 85, F413.

307. Waanabe, Y., Bevacqua, D.C., and Ohmoto, H. (2004) Microbial ecosystem in the oldest freshwater lake revealed from a drill core of the 2.76 Ga hardey Formation, Pilbara district, Western Australia. EOS, Transactions, American Geophysical Union, AGU Fall Meeting, v. 85, F414

308. Ohmoto, H. (2005) The Penn State Astrobiology Research Center: The evolution of a habitable planet. Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado *Astrobiology*, v.5, 172.

309. Bevacqua, D.C., Watanabe, Y. & Ohmoto, H. (2005) World’s oldest hematite (3.46 Ga) from Marble Bar, Western Australia. Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado *Astrobiology*, v.5, 187.

310. Jordan, H. & Ohmoto, H. (2005) Framboidal pyrite: prebiotic catalyst and molecular scaffold? Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado, *Astrobiology*, v.5, 222.

311. Klarke, A.I., Bevacqua, D.C.& Ohmoto, H. (2005) Archean Bisophere Drilling Project (ABDP) core data sharing: web interface. Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado,*Astrobiology*, v.5, 234.

312. Ohmoto, H., Naraoka, H., Yamaguchi, K., Kawkgawa, T. & Watanabe, Y. (2005) Large accumulations of sulfide-rich “organic oozes” in Archean seas. Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado, *Astrobiology*, v.5, 242.

313. Otake, T., Watanabe, Y., Alterman, W. & Ohmoto, H. (2005) “Detrital pyrite” in Archean conglomerates is not evidence for an anoxic atmosphere. Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado,, *Astrobiology*, v.5, 261.

314. Watanabe, Y. & Ohmoto, H. (2005) Absence of mass independent sulfur isotope fractionation in 2.76 Ga freshwater and 3.0 Ga marine sediments. Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado, *Astrobiology*, v.5, 272.

315. Yamaguchi, K., Johnson, C.M., Beard, B.L., Ohkouchi, N. & Ohmoto, H. (2005) On the relationship among stable isotope compositions of Fe-S-Corg in the Archean-Paleoproterozoic black shales from South Africa and Australia and Cretaceous black shales from Italy. Biennial Meeting of the NASA Astrobiology Institute April 10-14, 2005, Boulder, Colorado, *Astrobiology*, v.5, 273.

316. Otake, T., Wesolowski, D.J., Anovitz, L.M., Hayashi, K. & Ohmoto, H. (2005) Magnetite transformation to hematite under high H2 pressure at 150°C. 15th Annual V.M. Goldschmidt Conference, Moscow, Idaho, May, 2005, *Geochimica et Cosmochimica Acta*, Supplement, A425.

317. Ohmoto, H., Watanabe, Y. & Ikemi, H. (2005) The absence of mass independent fractionation of sulfur isotopes in Archean sedimentary rocks: an insignificant phenomenon? 15th Annual V.M. Goldschmidt Conference, Moscow, Idaho, May, 2005, *Geochimica et Cosmochimica Acta*, Supplement, A450.

318. Ohmoto, H. (2005) Biogenic origin for organic matter in chert/jasper and shales of the 3.46 Ga Towers Formation, Pilbara, Western Australia. Earth System Processes 2 8-11 August 2005, Calgary, Alberta, Canada Abstracts with Programs, 28.

319. Yamaguchi, K., Johnson, CM., Beard, B.L., Ohkouchi, N. & Ohmoto, H. (2005) Bacteriogenic sulfide formation: stable isotope systematics of iron-sulfur-organic carbon in the Archean-Paleoproterozoic black shales and Cretaceous black shales. Earth System Processes 2 8-11 August 2005, Calgary, Alberta, Canada Abstracts with Programs, 28.

320. Ohmoto, H. & Watanabe, Y. (2005) Geologic evidence for the early developments of an oxygenated atmosphere, sulfate-rich oceans, and diverse marine- and terrestrial biospheres. Earth System Processes 2 8-11 August 2005, Calgary, Alberta, Canada Abstracts with Programs, 34.

321. Watanabe, Y., Klarke, A.I., Poulson, S. & Ohmoto, H. (2005) The absence of mass independent sulfur isotope fractionation in Archean sedimentary rocks: evidence for an oxic atmosphere? Earth System Processes 2 8-11 August 2005, Calgary, Alberta, Canada Abstracts with Programs, 34.

322. Ohmoto, H. (2005) Chemical evolution of the atmosphere and oceans: constraints from banded iron formations. The Annual Meeting of the Geological Society of America, 16-19 October 2005, Salt Lake City, Utah Abstracts with Programs, 238.

323. Ohmoto, H. (2005) The Archean sulfur cycle. The Annual Meeting of the Geological Society of America, 16-19 October 2005, Salt Lake City, Utah Abstracts with Programs, 332.

324.Yamaguchi, K.E., Kato, Y., Nakamura, K., Hoashi, M., Bevacqua, D. C., Suzuki, K., Watanabe, Y., Nedachi, M., and Ohmoto, H. (2006) REE+Y geochemistry of Marble Bar Chert: Evidence for oxygenated deep oceans 3.46 billion years ago. *Astrobiology* ***6,***124.

325. Otake, T., Wesolowski, D.J., Anovitz, L.M., Allard, L.F., Jr., and Ohmoto, H. (2006) Experimental evidence for non-redox formation of hematite from magneite under reducing conditions. *Astrobiology* ***6,***131.

326. Ohmoto, H. (2006) A new perspective on the Archean biosphere: a summary of recent investigations on ABDP cores. *Astrobiology* ***6,***150.

327. Watanabe, Y., Klarke, A., and Ohmoto, H. (2006) MIF-S in Archean sedimentary rocks: Products from early diagenesis of organic-rich sediments? *Astrobiology* ***6,***150-151.

328. Altinok, E. and Ohmoto, H. (2006) Preliminary stratigraphic and mineralogic investigation of the ABDP #8 core from the Pilbara Craton, Australia. *Astrobiology* ***6,***203.

329. Grymes, R., Ohmoto, H., Buick, R., Anbar, A., Summons, R., and D’Hondt, S. (2006) The Astrobiology Drilling Program Update. *Astrobiology* ***6,***238.

330. Bevacqua, D. C., Watanabe, Y., and Ohmoto, H. (2006) Origin of hematite in the 3.46 Ga Towers Formation. *Astrobiology* ***6,***230.

331. Watanabe, Y., Naraoka, H., and Ohmoto, H. (2006) Mass independent fractionation of sulfur isotopes during thermochemical reduction of native sulfur, sulfite and sulfate by amino acids. *2006 Joint Assembly, Baltimore, Maryland,* V42A-02.

332. Ohmoto, H., Watanabe, Y., and Lasaga, A. (2006) inking the MIF-S record of sedimentary rocks to the thermal and biological evlution of the Earth. *2006 Joint Assembly, Baltimore, Maryland,* V42A-03.

333. Bevacqua, D. C., Hoashi, M., Kato, Y., Watanabe, Y., and Ohmoto, H. (2006) Hematite formation by oxygenated groundwater at 2.76 Ga and by oxygenated seawater at 3.46 Ga. *Abst. with Programs, Geol. Soc. Am., Ann. Mtg*., 46-10.

334. Otake, T., Wesolowski, D., Anovitz, L.N.,Allard, L.F., and Ohmoto, H. (2006) Experimental evidence of non-redox transformation between magneite and hematite under H2-rich hydrothermal conditions. *Abst. with Programs, Geol. Soc. Am., Ann. Mtg*., 95-13.

335. Watanabe, Y. and Ohmoto, H. (2006) MIF-S record in sedimentary rocks and indication of atmospheric or biological evolution. *Abst. with Programs, Geol. Soc. Am., Ann. Mtg*., 158-10.

336. Altinok, E. and Ohmoto, H. (2006) Soil formation beneath the Earth’s oldest known (3.46 Ga) unconformity. *Abst. with Programs, Geol. Soc. Am., Ann. Mtg*., 221-13.

337. Ohmoto, H., Watanabe, Y., Allwood, A.C., Burch, I.W., Knauth, P., Yamaguchi, K.E., and Johnson, I. (2006) Discovery of probable >3.43 Ga paleolaterites in the Pilbara Craton, Western Australia. *EOS Trans. AGU*, **87(52)**, V24B-07.

338. Watanabe, Y., Ohmoto, H., and Naraoka, H. (2006) Mass independent fractionation of sulfur isotopes during thermochemical sulfate reduction: implications in the origins of pyrite in Archean sedimentary rocks and sulfur in petroleum and natural gas. *EOS Trans. AGU*, **87(52)**, V21D-08.

339. Naraoka, H., Watanabe, Y., and Ohmoto, H. (2006) Thermochemical reduction experiments of native sulfur, sulfite, and sulfate by amino acids at 150 – 200°C. *EOS Trans. AGU*, **87(52)**, V11C-0597.

340. Ohmoto, H. and Watanabe, Y. (2007)The MIF-S record of sedimentary rocks: an indicator of atmospheric, thermal, or biological evolution of the Earth? *Geophysical Research Abstracts,* ***9,*** 08085.

341. Ohmoto, H. and Watanabe, Y. (2007) Geochemical evidence for the early development of modern-styled ecosystems and an oxygenated atmosphere. *Atrobiology,* **7*,***492.

342. Watanabe, Y. and Ohmoto, H. (2007) Mass independent fractionation of sulfur isotopes during thermochemical sulfate reduction: implications to the biosphere evolution. *Atrobiology,* **7*,***533.

343. Ohmoto, H. Watanabe, Y., Allwood, A., Burch, I., Knauth, L.P., Yamaguchi, K., Johnson, I., and Altinok, E. (2007) Formation of probable lateritic soils ~3.43 Ga in Pilbara Craton, Western Australia. *Goldschmidt Conference Abstracts 2007* A733.

344. Watanabe, Y. and Ohmoto, H. (2007) Kiking the MIF-S record of sedimentary rocks to biological evolution. *Goldschmidt Conference Abstracts 2007* A1093.

345. Yamaguchi, K.E., Johnson, C.M., Beard, B.L., Poulson, S.R., and Ohmoto, H. (2007) Coupled C-S-Fe isotope variations in Archean-Paleoproterozoic shales trace microbial metabolisms and redox state in the early Earth. *Goldschmidt Conference Abstracts 2007* A1136.

346. Ohmoto, H., Hoashi, M., Otake, T. et. Al. (2008) Origins of hematite, magneitei and siderite in banded iron formations. *Geochimica et Cosmochimica Acta, Goldschmidt Conference Abstracts,* A699.

347. Otake, T., Lasaga, A.C., Watanabe, Y. and Ohmoto, H. (2008) Anomalous S isotope fractionations during reactions with an organic surface. I: Theoretical investigations. *Geochimica et Cosmochimica Acta, Goldschmidt Conference Abstracts,* A712.

348. Watanabe, Y., Otake, T., Lasaga, A.C., and Ohmoto, H. (2008) Anomalous S isotope fractionations during reactions with an organic surface. II: Investigations on natural and experimental systems. *Geochimica et Cosmochimica Acta, Goldschmidt Conference Abstracts,* A712.

349. Johnson, I., Watanabe, Y., Stewart, B., and Ohmoto, H. (2009) Earth’s oldest (3.4 Ga) lateritic paleosol in the Pilbara Craton, Western Australia. *Geochimica et Cosmochimica Acta,* **73,**

350. Johnson, C.M., Yamaguchi, K.E., Poulson, S.R., and Ohmoto, H. (2009) Fe, S, and C isotope record great microbial diversity in the Neoarchean. *Geochimica et Cosmochimica Acta,* **73,** A600.

351. Ohmoto, H. (2009) Redox evolution of volcanic gas through geologic time. *Geochimica et Cosmochimica Acta,* **73,** A965.

352. Watanabe, Y. and Ohmoto, H. (2009) Why anomalous S isotope signatures disappeared at ~2.4 Ga ago? *Geochimica et Cosmochimica Acta,* **73,** A965

353. Hoashi, M., Bevacqua, D.C., Otake, T., Watanabe, Y., Hickman, A., Utsunomiya, S., and Ohmoto, H. (2009) Primary haematite formation in an oxygenated sea 3.46 billion years ago. *Geochimica et Cosmochimica Acta,* **73,** A536.

354. Johnson, C.M., Yamaguchi, K.E., Poulson, S.R., Ohmoto, H., and Beard, B.J. (2009) Fe, S, and C isotopes record great microbial diversity in the Neoarchean. *Geochimica et Cosmochimica Acta,* **73,** A600.

356. Yamaguchi, K.E., Kato, Y., Nakamura, K., Suzuki, K. Watanabe, Y., Nedachi, M. and Ohmoto, H. REE+Y geochemistry of the 3.46 Ga Marble Bar Chert recovered by the Archean Biosphere Drilling Project. Goldschmidt conference, Davos, Switzerland. Geochim. Cosmochim. Acta, 73 (S13), A1469 (2009).

357. Hamasaki, H., Ishibashi, J., Ueno, Y., and Ohmoto, H. (2010) Helium and carbon geochemistry of hydrothermal fluids on the Southern East Pacific Rise at 11-32 degrees S. *Geochimica et Cosmochimica Acta,* **74,** A372.

358. Ohmoto, H., Bevacqua, D.C., Johnson, I., and Watanabe, Y. (2010) Geochemical cycles of Fe, Mo, U, Cu, Cr, REEs, and S during the period 3.5-3.2 Ga ago. *Geochimica et Cosmochimica Acta,* **74,** A774.

359. Watanabe, Y., Hoashi, M., and Ohmoto, H. (2010) Evicence for the presence of cyanobacteria and thermophylic methanogens in a 3.46 Ga sea, Western Australia. *Geochimica et Cosmochimica Acta,* **74,** A1116.

400. Brainard, J.L. and Ohmoto, H. (2010) Methane hydrates: A major contributor to atmospheric composition? American Geophysical Union 2010 Fall Meeting Abstract GC43D-0999.

401. Hamasaki, H., Watanabe, Y. and Ohmoto, H. (2010) An experimental investigation of multiple sulfur isotope fractionations during heterogenous reactions between SO2 and activated carbon. American Geophysical Union 2010 Fall Meeting Abstract V31B-2321.

402. Ohmoto, H., Bevacqua, D. C., Watanabe, Y. (2010) Origins of hematite and redox-sensitive elements in a 3.46 Ga jasper-basalt sequence in ABDP #1 core from Pilbara, Western Australia. American Geophysical Union 2010 Fall Meeting Abstract B41B-0310.

403. Watanabe, Y. and Ohmoto, H. (2010) Multiple sulfur isotope characteristics of 3.46-2.7 Ga sedimentary rocks from drill cores of the Archean Biosphere Drilling Project (*Invited*). American Geophysical Union 2010 Fall Meeting Abstract B52B-01.

404. Watanabe, Y., Bevacqua, D. C., Ohmoto, H. (2010) Evidence for a diverse microbial community in a 3.46 Ga ocean from ABDP#1 core. American Geophysical Union 2010 Fall Meeting Abstract B41B-0305.

405. Ohmoto, H. (2011) Geochemical cycles of bio-essential elements on early Earth. Abstracts with Program, Origins 2011, Montpellier (France), July 3rd – 8th, 2011.

406. Ohmoto, H. (2011) Submarine hydrothermal systems: A major clue for the chemical, biological and tectonic evolution of the Earth. Ottawa 2011. Joint Ann. Mtgs. Of GAC/AGC – MAC/AMC – SEG – SGA, May 25-27, Ottawa, Abstract Volume 157-158.

407. Ohmoto, H., Watanabe, Y., Yamaguchi, K.E., Bevaacqua, D.C., Johnson, L., and Rushton, T. (2011) Development of the modern-style geochemical cycle of uranium by 3.5 Ga: A solution to the ‘lead paradox’. Mineralogical Magazine, Goldschmidt Conference Abstracts 1561.

408. Ohmoto, H., Lasaga, A.C., Watanabe, Y., and Yamaguchi, K. (2011) Evidence for the fully-oxygenated oceans and atmosphere during the Archean Eons. Geological Society of America, Ann, Mtgs., Minneapolis, MN., Abstract Volume, Paper No. 228-4.

409. Brainard, J.L. and Ohmoto, H. (2011) Did methane from marine methane hydrate decrease the atmospheric pO2 level to cause the P-T extinction? Geological Society of America, Ann, Mtgs., Minneapolis, MN., Abstract Volume, Paper No. 153-10.

410. Ohmoto, H. and Watanabe, Y. (2011) Linking the Fe-, Mo-, and Cr isotope records with the multiple S isotope record of Archean sedimentary rocks. *AGU*

411. Ohmoto, H. (2011) Early evolution of the continental crust, the oxygenated atmosphere and oceans, and the heterogeneous mantle. *AGU*

412. Ohmoto, H., Watanabe, Y., Brainard, J., and Chorney (2012) Evidence in the isotopic records of C, N, S, Fe, Mo, Cr and Pb in Archean roclks for the early development of the fully-oxygenated atmosphere and oceans. *Astrobiology,* AbSciCon Abst

413. Brainard, J.L., Chorney, A., and Ohmoto, H. (2012) Evidence in volcanogenic massive sulfide deposits for sulfate-rich oceans. *AbSciCon*

414. Brainard, J.L., Chorney, A., and Ohmoto, H. (2012) Volcanogenic massive sulfide deposits host the evidence for sulfate-rich Archean oceans. *Goldschmidt Conference*

415. Watanabe, Y., Hamasaki, H., Chorney, A.P., and Ohmoto, H. (2012) Anomalous fractionations of sulfur isotopes during high temperature reactions between solid organic C and oxidized S compounds. *Goldschmidt Conference*

416. Ohmoto, H., Watanabe, Y., Yamaguchi, K.E., Hamasaki, H., Brainard, J., and Chorney, A.P. (2012) Evidence for the O2 and CO2 rich Archean atmosphere. *Goldschmidt Conference*

417. Brainard, J.L. (2012) Sulfate-rich Archean oceans. *AGU*

418. Kerrich, R. and Ohmoto, H. (2012) Uranium, Ce and Fe(III) enrichments in Archean igneous rocks indicating the early development of the oxygenated atmosphere-ocean-crust system. *AGU*

419. Ohmoto, H. (2012) The Archean kerogen paradox. *AGU*