Earth Probe Newsletter
COMPRES
An NSF funded Consortium for Materials Properties Research in Earth Sciences
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The new COMPRES/GSECARS gas loading system

FEATURE ARTICLE

The diamond anvil cell (DAC) is the most commonly used device for obtaining static high pressures above 30 GPa. Members of the COMPRES community perform many experiments in diamond anvil cells, often using synchrotron sources, such as those at the APS, NSLS and ALS. In order to have the sample in the DAC be subject to quasi-hydrostatic pressure it is necessary to surround the sample with a pressure medium that is relatively soft. It is also desirable to use a medium that is chemically inert to the sample, which is optically and x-ray transparent, and which does not produce a strong x-ray diffraction signal. For pressures above about 20 GPa the rare gases are the preferred pressure media. Helium and neon are ideal because of their low x-ray scattering cross sections and low strength, which minimizes the lattice strain in the sample. However, it is necessary to load them into the DAC at a high gas pressures. If the gas pressure is 100-200 MPa then

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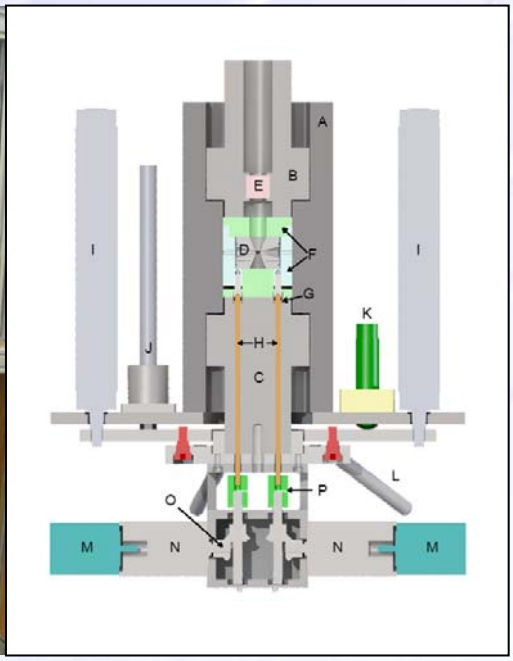
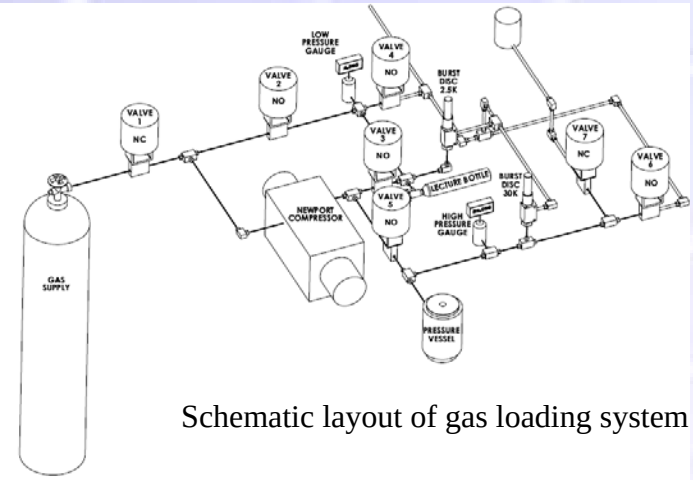


Figures above: Cross-section view of the pressure vessel. A) pressure vessel (outer diameter=16.5cm); B) top end plug; C) bottom end plug; D) diamond anvil cell; E) sapphire window; F) Cell clamp; G) M6 screw; H) rotary feedthroughs; I) pneumatic lifter; J) guide bearing; K) damper L) Handle for rotating base assembly; M) stepper motor; N) gear reducer; O) 90° gear; P) coupling. The top and bottom end plugs are rotated 45° to seal using a clover-leaf closure. The base assembly (consisting of the bottom end plug, cell clamp with diamond anvil cell, stepper motors and gears) is raised pneumatically and then rotated 45° to seal the pressure vessel.

In this issue

The new COMPRES/GSECARS gas loading system (cont'd)

the density is comparable to the liquid at room pressure. Such systems operate by loading a DAC into a pressure vessel, pressurizing the vessel, and then remotely sealing the DAC, trapping the high-pressure gas with the sample inside the gasket hole between the two diamonds. Other synchrotron sources (e.g. ESRF, SPrING-8, and CHESS) have gas loading systems on site, but there was previously no gas-loading system available at the APS. In fact, there was no gas loading system in the US that was available as a community facility. COMPRES has supported the development of such a system, through an Infrastructure Development project. This project was undertaken jointly with GSECARS. COMPRES provided the capital equipment, and GSECARS provided the personnel support to design, fabricate and assemble the system. The system is located at GSECARS (sector 13 at the APS), but is available to the entire community, whether the DAC will be used on APS beamlines or elsewhere.



Schematic layout of gas loading system

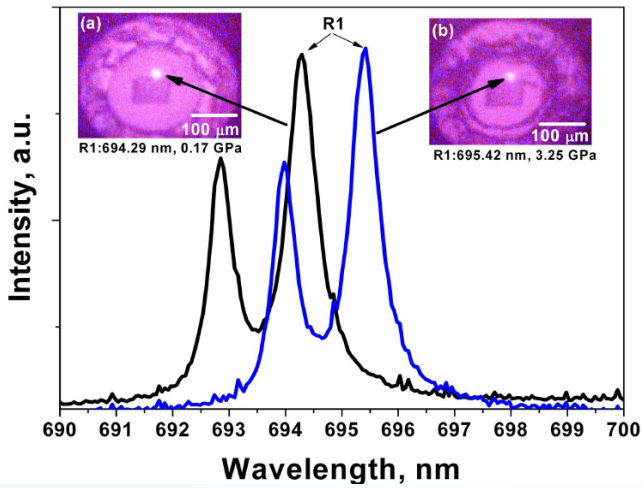
System design goals

Because COMPRES, GSECARS, and APS are national user facilities, and have hundreds of high-pressure users from dozens of institutions, we wanted to build a system that could be safely and easily operated by our users with appropriate training. These scientists bring many different DAC designs to our beamlines. We therefore developed the following goals when designing our system:

- Ability to load many kinds of DACs. A closure mechanism (motor driven screws) closes a clamping device, which in clamps the DAC closed. By not turning the tightening screws on the DAC directly, it is simple to accommodate different DAC designs. In many cases they just require different spacers, and in some cases a different clamp design.
- Optical access to view the cell while loading. This allows one to see when the diamonds contact the gasket as the cell is closed. It also allows an online ruby fluorescence system for directly measuring the pressure as the cell is closed.
- Vacuum pump to clean system before loading the gas.
- Ability to have no electrical parts except pressure transducers in the cabinet enclosing the high pressure system. This allows flammable gas operation (e.g hydrogen) in the future.
- Easy to safely operate. Use of air-driven valves, safety interlocks, and computer control.

Experience to date

The system has only recently received final safety approval for operation. We have now loaded more than 20 cells, with nearly 100% success rate. We have loaded two types of cells. The first is the symmetrical design, 48mm diameter and 36mm tall. The other is a 3-post design (43 mm diameter, 25 mm tall), using a simple cylindrical holder that fits inside the standard clamp shown in. The cells have been loaded with He or Ne at pressures of 15.8-17.9 MPa.



Typical spectrum of the ruby fluorescence in the DAC during gas loading and corresponding images of the sample chamber in the DAC (inserts) inside the pressure vessel obtained through the 25 mm thick sapphire window. A ruby sphere is loaded in the cell along with a single crystal sample, and the laser induced fluorescence is visible through the color video camera in these images. The wavelength shift of the ruby fluorescence is used to measure the pressure in the DAC. (a) Before sealing the DAC with Ne gas pressure of 0.17 GPa. The clamp was then closed, increasing the pressure to 1.7 GPa (not shown). The cell and clamp were removed from the pressure vessel and the DAC screws were tightened. (b) The cell and clamp repositioned in the pressure vessel, pressure is now 3.25 GPa

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The new COMPRES/GSECARS gas loading system (*cont'd*)

The ability to measure the pressure as the stepper motors are driven to close the cell clamp has proven to be invaluable. The system does not need to be calibrated at all in order to close the cell and reach a desired pressure. The operator simply rotates the stepper motors, closing the cell clamp, until the pressure measured with the ruby luminescence system begins to increase, and then continues to close it until a desired pressure is reached, typically 1-2 GPa. Once this pressure is reached the pressure vessel is vented and the cell is removed. The screws on the diamond cell itself are then tightened, using an Allen wrench that passes through access holes in the top of the cell clamp. Once these screws are tightened the cell is normally put back into the pressure vessel at room pressure, in order to use the ruby luminescence system to verify that the pressure is now higher than it was with the clamp alone. If it is, then the operator can be sure that the DAC screws are now providing the confining pressure, and the cell clamp can be loosened and removed.

One of our users, Steve Jacobson from Northwestern University had collected data sets on single crystals of MgO loaded with the system. The data are excellent, showing a very smooth compression curve up to 120 GPa (1.2 million atmospheres).

Future plans

We expect to be able to accommodate several additional cell types in the next few months. With some minor modification to the current cell clamp, we will be able to load cells of the ETH design (50mm diameter, 25 mm tall). We will build a new cell clamp to load panoramic DACs, and we are currently accepting and prioritizing requests to build cell holders for other types of diamond anvil cells. We are upgrading the system to be able to rapidly switch between He and Ne, and to be able to conveniently use other gases as well. We are also actively pursuing finding a vendor who can supply copies of this system commercially, since at least six other laboratories have expressed an interest in obtaining one.

—— By Mark Rivers, Vital Prakapenka, Atsushi Kubo, Clayton Pullins, *Center for Advanced Radiation Sources, University of Chicago, Chicago, USA*

Acknowledgements

The authors thank S. Sinogeikin for advice on the ruby fluorescence system and N. Lazarz, F. Sopron, E. LaRue and G. Macha for technical support. Mati Meron helped with the safety analysis. This research was partially supported by COMPRES, the Consortium for Materials Properties Research in Earth Sciences under NSF Cooperative Agreement EAR 06-49658. It was also supported by GeoSoilEnviroCARS (Sector 13), Advanced Photon Source (APS), Argonne National Laboratory. GeoSoilEnviroCARS is supported by the National Science Foundation - Earth Sciences (EAR-0622171) and Department of Energy - Geosciences (DE-FG02-94ER14466). Use of the Advanced Photon Source was supported by the U. S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

AGU Inge Lehmann Medal of 2007 awarded to Dave Mao

The American Geophysical Union has awarded Carnegie's Ho-kwang (Dave) Mao the Inge Lehmann Medal for "outstanding contributions to the understanding of the structure, composition, and dynamics of the Earth's mantle and core." Mao has been a pioneer in high-pressures physics and related technology development for over 30 years. The Lehmann Medal was first awarded in 1997. It is named in honor of Danish seismologist Inge Lehmann and her many contributions to the understanding the Earth's mantle and core. The medal is given every other year. Mao is the first mineral physicist to win this medal.

President's Message

— Robert C. Liebermann

Following are a number of items that may be of interest to you as members of the COMPRES community.

2nd V-Lab Workshop

The Virtual Laboratory for Earth and Planetary Materials Studies [VLab] held its 2nd Workshop at the University of Minnesota on August 6-10, 2007 convened by Renata Wentzcovitch, PI of the VLab Project. In conjunction with this workshop, the members of the the Elasticity Grand Challenge of the COMPRES Initiative held a two-day meeting. Details of the program may be found on the website at: http://www.vlab.msi.umn.edu/events/secondworkshop.shtml.

Seminar on Density, Temperature and Elastic Constants of Earth's Mantle II.

On September 12-16, I attended a mantle seminar at the Castle of Linderhof in the Bavarian Alps south of Munich. This seminar was convened by Hans-Peter Bunge, John Brodholt and Brian Kennett and sponsored by the Wilhelm and Else Heraeua Foundation. Invited lectures were presented by representatives of the seismology, mineral physics and geodynamics communities. Representing mineral physics were Tetsuo Irifune, Artem Oganov, Lars Stixrude, Bob Liebermann and Guy Masters masquerading as a closet mineral physicist.

Joint 21st AIRAPT and 45th EHPRG International Conference on High Pressure Science and Technology.

The joint AIRAPT and EHPRG conference was held in Catania, Italy from September 17-21. I attended as a representative of COMPRES and also delivered a paper on "Ultrasonic measurements of the elasticity of materials at elevated pressures and rempera-tures: Implications for determination and calibration of pressure.

At this conference, two members of the COMPRES community were honored by receiving major awards:

Takehiko Yagi of the University of Tokyo was awarded the Bridgman Medal of AIRAPT, thus joining a distinguished group of mineral physicists who have won this award since its inception in 1977: Francis Birch in 1983, Ho-kwang Mao in 1989, William Bassett in 1997 and Sergei Stishov in 2005.

Agnes Dewaele from the Commissariat à l'Energie Atomique in France was awarded the Outstanding Young Scientist Award of the European High Pressure Research Group [EHPRG]. Previous awardees from our COMPRES community include Alex Goncharov in 1991, Stefan Klotz in 1995, and Artem Oganov in 2004.

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2007 Outstanding Student Award in Mineral and Rock Physics to Yasuhiro Kuwayama of Tokyo Institute of Technology

Dr. Kuwayama (right in the photo) was recognized for his discovery of the pyrite-type high-pressure form of silica and for his research on phase relations and physical properties of iron-nickel alloys at multi-megabar pressures and high temperatures, significantly advancing knowledge of the physical state of Earth's core. He received his Ph. D. degree from the Tokyo Institute of Technology working under the supervision of Professor Kei Hirose (left in the photo).

President's message (*cont'd*)

High Pressure Synergetic Center-HPSynC

On November 30, 2007, Jay Bass and I attended the first meeting of the Board of Governors for HPSynC, a new research initiative at the APS and learned of progress and plans in the first year of operation.

High Pressure Synchrotron Workshop at the APS

On December 5-6, I attended an International Workshop on Synchrotron High-Pressure Mineral Physics and Materials Science at the APS of the Argonne National Laboratory. This workshop was convened by Tetsuo Irifune of Ehime University and Yanbin Wang of the University of Chicago and was attended by more than 50 persons from throughout the world of mineral physics.

Top 50 Most Cited Authors in PEPI for 2004-2007

Elsevier Publications recently announced a list of the Top 50 Most Cited Authors in PEPI for the period 2004-2007. Papers from the field of mineral and rock physics comprise more than half of this list. Our congratulations to all of the authors, and especially to those from our COMPRES community.

Fall 2007 AGU Meeting in San Francisco

The annual fall meeting of the AGU in San Francisco was most certainly the highlight of December for the COMPRES community.

a. Special Sessions on mineral and rock physics

There were many special sessions organized by mineral physicists, including Union sessions as well as those in Mineral and Rock Physics. Our compliments and thanks to Heather Watson of the Lawrence Livermore National Laboratory for serving on the AGU Program Committee.

b. AGU Awards for Mineral Physicists

(1). Ho-kwang (Dave) Mao was honored by receiving the 2007 Lehmann Medal in recognition of outstanding contributions to understanding of the structure, composition, and dynamics of the Earth's mantle and core. See article and photo elsewhere in this newsletter.

(2). Eiji Ohtani from Tohoku University and Hugh O'Neill from the Australian National University were selected to receive the Bowen Award from the Section on Volcanology, Petrology and Geochemistry and delivered special lectures.

(3) The Outstanding Student Award in Mineral and Rock Physics was presented to Yasuhiro Kuwayama of the Tokyo Institute of Technology. Kuwayama-san joins a long list of previous awardees from 1990 to 2007 which can be seen on the AGU website at: http://www.agu.org/inside/mineral.html. See article and photo elsewhere in this newsletter.

c. Exhibition Booth

Once again, COMPRES and GSECARS co-sponsored an exhibition booth at the Fall AGU Meeting. Our thanks to Glenn Richard and Michael Vaughan for staffing the booth for COMPRES, along with Mark Rivers and his colleagues from GSECARS.

Meetings of COMPRES Committees at the Fall AGU

All the Standing Committees of COMPRES held breakfast meetings to review progress reports for Community Facilities Operations and Infrastructure Development Projects for Year #1 of COMPRES II and program plans and budget requests for Year #2.

In addition, a Special Committee to explore the implications of incorporation for COMPRES met with representatives of other Earth Science consortia and centers. This Committee is chaired by Jay Bass and includes Michael Brown from the Executive Committee and Louise Kellogg and Guy Masters from the Advisory Council.

Attending the breakfast meeting as guests and advisors were:

Adam Dziewonski—IRIS
Rick Hooper-CUASHI
Meghan Miller-UNAVCO
David Simpson—IRIS

2008 Class of Fellows of the AGU

Among the newly elected Fellows of the AGU for 2008 are 4 members of the mineral physics community:

Patricia Dove from Virginia Polytechnic Institute and State University
Greg Hirth from Brown University
Tetsuo Irifue from Ehime University in Matsuyama, Japan
Renata Wentzcovitch from the University of Minnesota (*continued on page 6*)

President's message (*cont'd*)

Planning Workshops at Brookhaven National Laboratory for NSLS and NSLS II

On 17 December 2007, the DOE granted Critical Decision 2 [CD-2] status to the NSLS II at Brookhaven National Laboratory. During January and February 2008, a series of workshops were held to confirm plans for the new 5-year science plan for NSLS, and lay the groundwork for new beamline installations at NSLS-II, which is scheduled for first light in 2015. Members of the COMPRES community have been active as organizers and attendees at these workshops..

2009 Dana Medal of the Mineralogical Society of America

Ronald Cohen from the Geophysical Laboratory of the Carnegie Institution of Washington has been selected to receive the 2009 Dana Medal of the MSA.

New faculty appointments in mineral physics in the U. S. and overseas.

We take great pleasure in noting the following new faculty appointments in mineral physics:

Carmen Sanchez-Valle as Professor at the ETH in Zürich, Switzerland.

Denis Andrault at the Universite Blaise Pascal [France]

Haozhe Liu as Professor at the Harbin Institute of Technology in China.

Wendy Mao as an Assistant Professor at Stanford University.

Burkhardt Militzer at the University of California at Berkeley.

Razvan Caracas at the École Normale Supérieure Lyon [France].

Takao Okuchi at Okayama University [Japan]

Daniele Antonangeli and

Anne-Line Auzende—both at the Institut de Minéralogie et de Physique des Milieux Condensés in Paris.

A number of mineral physics faculty have recently announced their transition to a new academic institution, including:

Pamela Burnley from Georgia State University to the University of Nevada at Las Vegas in June 2007.

Tracy Rushmer from the University of Vermont to Macquarie University in Australia in July 2007.

Jiuhua Chen from Stony Brook University to Florida International University in September 2007.

Lars Stixrude from the University of Michigan to University College London in 2008.

Carolina Lithgow-Bertelloni will also join the faculty of UCL.

Kanani Lee from New Mexico State University to Yale University in June 2008.

New Members of COMPRES

The University of Michigan with Rebecca Lange as the Elector and Youxue Zhang as the Alternate Elector. This brings the number of U. S. institutions which are members of COMPRES to 51.

Harbin Institute of Technology in China with Haozhe Liu as the representative. This is the second member institution from China and brings the number of foreign affiliates to 31.

2008 Annual Meeting of COMPRES at Cheyenne Mountain Resort, Colorado Spings, CO

Planning is proceeding for the 2008 Annual Meeting from June 25-28.

Keynote Speakers include:

Rajdeep Dasgupta-Rice University

William McDonough-Univ of Maryland

Louise Kellogg-UC Davis

Sean Raymond-Univ of Colorado

Rebecca Lange-Univ of Michigan

Justin Revenaugh-Univ of Minnesota

Jie Li-Univ of Illinois

Watch the COMPRES website for additional details and registration information.

New Project Assistant for COMPRES

We take great pleasure in announcing that the new Project Staff Assistant for COMPRES is Emily Vance. For the past 4 years, she has been the Project Assistant for SNAP: Spallation Neutrons at Pressure, and worked with John Parise, Chris Tulk, Dave Mao and Rus Hemley. Please join me in welcoming Emily to the COMPRES family. ■

Emily at her new duty

International Workshop on Synchrotron High-Pressure Mineral Physics and Materials Sciences

International Workshop on Synchrotron High-Pressure Mineral Physics and Materials Sciences was held at the Advanced Photon Source at Argonne National Laboratory on Dec. 6 and 7, 2008. This workshop was sponsored by Geodynamics Research Center, Ehime University, Japan, GSECARS, and Center for Advanced Radiation Sources, the University of Chicago. Approximately sixty scientists (among whom about 17 were students and post-docs), from Japan, Europe and the US, attended the workshop and gave a total of fifty-two oral and poster presentations in four different sessions. Topics of discussion and presentation included high pressure techniques, synchrotron and other radiation sources related techniques, mineral physics and materials science. Presentations and abstract volume are available on the GSECARS website:
http://cars.uchicago.edu/gsecars/LVP/hp_min_phys/
A special proceedings volume has been arranged with the international journal High Pressure Research. The volume is expected to appear in fall of 2008.

The workshop was organized by Tetsuo Irifune (GRC, Ehime University) and Yanbin Wang (GSECARS, the University of Chicago). We thank all the participants for a productive workshop, Ms. Jane Andrew for her superb secretarial assistance, and COMPRES for helping distribute messages in the high pressure community. ■

— Yanbin Wang

Meeting site: Advanced Photon Source at ANL

Recent PhDs

Jozsef Garai,

Ph.D. 2007

Department of Earth Sciences

Florida International University

Dissertation:

Thermodynamic Description and Phase Transformation of Highly Symmetrical Monoatomic Structures

The Earth is a heat engine. The description of major geophysical phenomenon requires the comprehensive understanding of thermodynamics. The dissertation research addresses several unresolved questions in the field and offers theoretical explanations. The theoretical predictions are tested against experiments with positive results.

In addition to theoretical problems the dissertation also contains experimental work. The first complete infrared absorption spectra of carbonado confirmed the extraterrestrial origin of this diamond.

The predicted linear correlation between the volume coefficient of thermal expansion and the heat capacity was confirmed for highly symmetrical mono-atomic arrangements. The detected correlation allows calculating the volume coefficient of thermal expansion from an experiment conducted at any temperature.

It is well established that the product of the isothermal bulk modulus and the volume coefficient of thermal expansion is constant. Assuming a constant value for this product allows describing the volume-pressure-temperature relationship of a solid from three parameters. Investigating the temperature dependence of the Anderson-Grüneisen parameter it has been found that this parameter remains constant at temperatures higher than the Debye temperature. The constant value allows extrapolating the bulk modulus determined at convenient temperatures to the temperature of interest.

The volume is not an independent variable and must be broken down into its fundamental components when the relationships to the pressure and temperature are defined. Using zero pressure and temperature reference frame and breaking down the volume into its constituencies resulted in a new equation of state. The EoS is tested against the experiments on perovskite and epsilon iron.

Separating the experiments into 200 K ranges, the new EoS was compared to the most widely used finite strain, interatomic potential, and empirical isothermal EoSs such as the Burch-Murnaghan, the Vinet, and the Roy-Roy respectively. Correlation coefficients, RMSD's of the residuals, and Akaike Information Criteria were used for evaluating the fitting. Based on these fitting parameters, the new p-V-T EoS is competitive or better in every temperature range relative to the investigated conventional isothermal EoS. The Root-mean-square-deviations of the residuals are almost the same as the uncertainties of the experiments.

Analyzing the melting process it is suggested that the latent heat of fusion supplies the energy required for overcoming on the viscous drag resistance of the atoms. The calculated energies for melts formed from highly symmetrical packing arrangements correlate very well with experimentally determined latent heat values.

Investigating different optical properties of diamonds our group collected the first complete infrared absorption spectra of carbonado which confirmed the interstellar origin of this enigmatic diamond. This research is ranked #60 among the top 100 science stories of 2007 published in the January issue of Discover Magazine. The dissertation set up an all time best record at the department with seven journal publications and overall IF score of 16.52.

Statement:

I am very happy having a chance to work with Prof. Haggerty. His fascination with diamonds and especially with carbonado is inspiring. I learned a lot from our daily intellectual discussions covering all segments of geosciences.

I was collaborating with the Chemistry and the Physics Departments and I am especially thankful for the support and guidance of Prof. Jeffrey Jones.

Currently I am looking for a Postdoc position. I would like to continue my research on the EoS and carbonado but I like challenge of attacking any unresolved scientific questions. My broad scientific background allows me to explore a wide variety of topics. My latest research resulted in the mathematical description of the periodic table sequences.

-*Jozsef Garai* (http://www.garai-research.com)

Memorables

The First Mineral Physics Conference

The old photo below was shown during 2007 COMPRES meeting to entertain the participants. It brought respectable earlier faces to the younger generation of mineral physicists at the meeting and recalled many memories among the elders. We therefore invited Charles Prewitt to prepare this article to illustrate the photo to the COMPRES community. Prewitt and Liebermann are planning a feature article for EOS on the evolution of mineral physics over the past 30 years. ——— *Editor*

The first scientific conference focused on mineral physics as a specific topic was held at the Airlie House in Warrenton, Virginia, on October 17-19, 1977. The need for a conference on physics of minerals arose from extensive discussions among a few mineralogists and geophysicists over the previous 2-3 years. It was apparent that experimental and theoretical investigations into the relationship between interatomic forces and physical properties of minerals were central to current problems in the earth sciences, but efforts were fragmented in the sense that relevant research was being conducted by specialists in different disciplines such as crystallography, spectroscopy, and physical chemistry with little coordination or cooperation between researchers with different backgrounds and objectives. In the belief that there were many points of common interest, involving those interactions between atoms that determine the physical properties of minerals, a conference on mineral physics was organized which would, for the first time, bring together researchers concerned with these problems, and thus provide a unique forum for the exchange of information, the development of new ideas, and the stimulation of new research.

The conference was organized with Charles Prewitt and Robert Hazen as co-convenors and a Program Committee consisting of Jerry. Gibbs, Jack Tossell, Peter Bell, Bob Liebermann, and Charles Burnham. Generous support was received from the Carnegie Institution of Washington and the National Science Foundation. Nearly 80 scientists attended the conference, including several from physics and chemistry departments, and from overseas.

The conference was organized around five different sessions. The first session explored the successes and failures of the empirical approach, and included lectures on empirical bond valences, electrostatic

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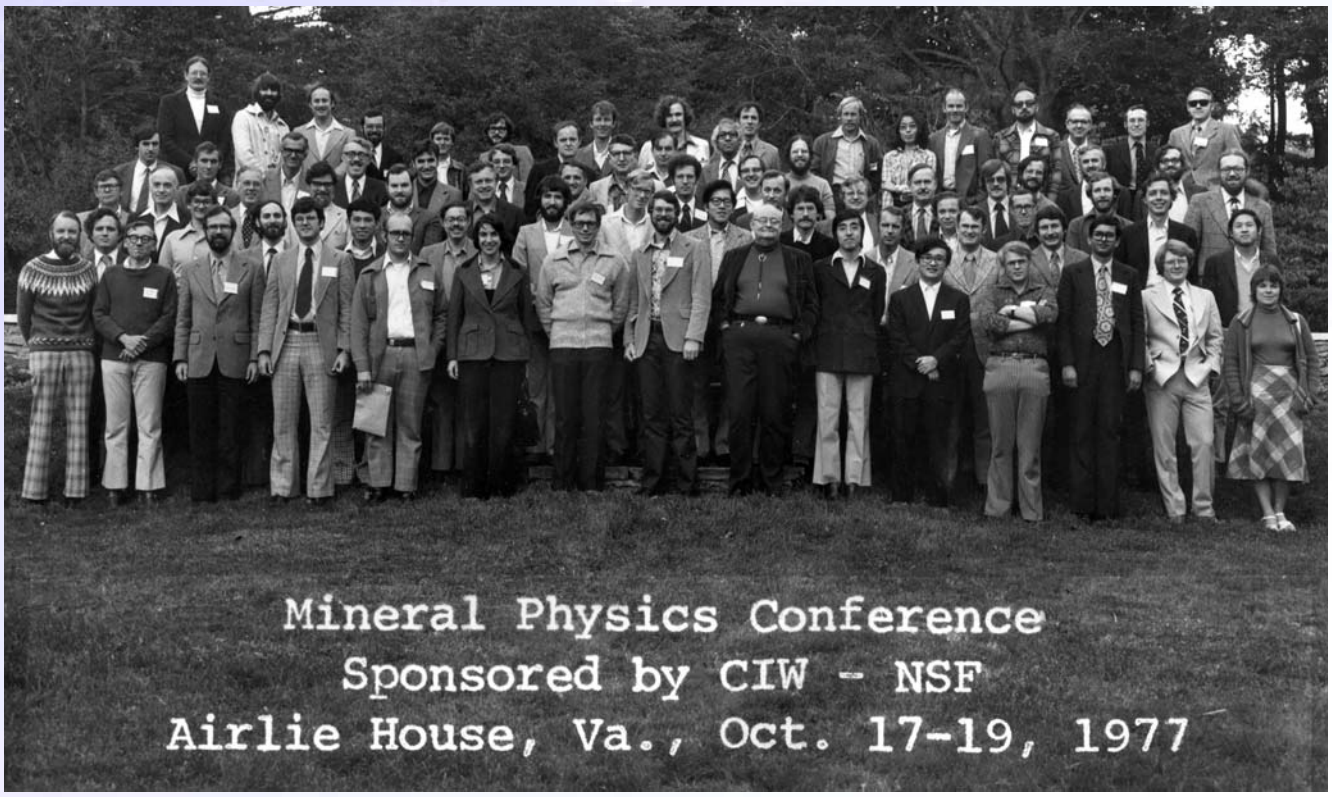

The First Mineral Physics Conference *(cont'd)*

energy calculations, and electric field gradient calculations. In the second session, aspects of the electronic structure, geometric structure, stabilities, and cohesive properties of minerals could be predicted using both molecular quantum mechanical models and quantum mechanical methods applicable to bulk solids. Electronic and magnetic effects of metal-metal interactions in minerals were the focus of the third session. The fourth session contained the principal contributions of the geophysical contingent to the conference. This included experimental techniques used to measure the elastic properties of solids as a function of pressure and temperature, empirica1 relationships between elastic and other physical properties of minerals and theoretical equations of state, and bonding in oxides and silicates. Session five was devoted to aspects of phase transformations and order-disorder processes, as well as experimental diffraction techniques, which help to understand bonding in minerals.

There was a general feeling afterward that the conference was a great success and that it was the forerunner of the worldwide trend making the practice of mineral physics a specific field in which one could pursue experimental or theoretical investigations of minerals and mineral-like phases that are so important in many different applications. Mineral physics has become a major component of many national and international meetings, and is a forum for communication by scientists from a wide range of disciplines. ■

— Charles Prewitt

HISTORY

COMPRES 6th Annual Meeting

2008 Annual Meeting of COMPRES

- *Interdisciplinary presentations*
- *Technological presentations*
- *Group discussions*
- *Annual business meeting*

Date: June 25-28
Place: Cheyenne Mountain Resort
Colorado Springs, CO

Arrival: Late PM, Wednesday, June 25
Departure: After lunch, Saturday, June 28

Travel Scholarship:

Travel scholarships will provide full or partial travel scholarships to those graduate students presenting abstracts for poster presentations at the Annual Meeting. The scholarships include up to $500 each for travel expenses incurred in attending the Annual Meeting; reimbursement will be via travel vouchers submitted with receipts at or following the meeting. To be eligible for a travel scholarship, the graduate students must 1) apply for the scholarship to COMPRES Central Office; 2) register for the meeting; 3) submit an abstract for a poster presentation at the meeting and 4) submit a recommendation letter from their mentor/advisor.

COMPRES ANNUAL MEETING

Congratulations

to following authors from mineral and rock physics community whose paper become top 50 most cited in PEPI, 2004-2007

L.S. Dubrovinsky, N.A. Dubrovinskaia, V. Prakapenka, F. Seifert, F. Langenhorst, V. Dmitriev, H.-P. Weber, T. Le Bihan, A class of new high-pressure silica polymorphs, *Physics of the Earth and Planetary Interiors 143–144 (2004) 231–240.*

Y. Fei, J. Li, K. Hirose, W. Minarik, J. Van Orman, C. Sanloup, W. van Westrenen, T. Komabayashi, K.-I. Funakoshi, A critical evaluation of pressure scale at high temperatures by in situ X-ray diffraction measurements, *Physics of the Earth and Planetary Interiors, Volume 143, Issue 1-2 (2004), Pages 515-526*

Frost DJ, Poe BT, Trønnes RG, Liebske C, Duba A, Rubie DC, A New Large-Volume Multianvil System. *Phys. Earth. Planet. Int. 143-44: 507-514, 2004.*

Nicolas Guignot and Denis Andrault, Equations of state of Na–K–Al host phases and implications for MORB density in the lower mantle, *Physics of The Earth and Planetary Interiors*, *Vol 143-144*, *107-128, 2004.*

Hirose, K., Shimizu, N., van Westrenen, W., Fei, Y., Trace element partitioning in Earth's lower mantle and implications for the geochemical consequences of partial melting at the core-mantle boundary, *Physics of the Earth and Planetary Interiors, 146, 249-260, 2004.*

Hofmeister, A.M., Enhancement of radiative transfer in the mantle by OH- in minerals. *Physics of the Earth and Planetary Interiors,* 146, 483-485.

Inoue, T., Y. Tanimoto, T. Irifune, T. Suzuki, H. Fukui and O. Ohtaka, Thermal expansion of wadsleyite, ringwoodite, hydrous wadsleyite and hydrous ringwoodite, *Phys. Earth Planet. Inter, 143-144, 279-290, 2004.*

Jacobsen, S.D., J.R. Smyth, H.A. Spetzler, C.M. Holl, and D.J. Frost, Sound velocities and elastic constants of iron-bearing hydrous ringwoodite. *Physics of the Earth and Planetary Interiors, 143-144, 47–56, 2004*

Katsura, T., K. Funakoshi, A. Kubo, N. Nishiyama, Y. Tange, Y. Sueda, T. Kubo, and W. Utsumi, A large-volume high P-T apparatus for in situ X-ray observation 'SPEED-mkII', *Physics Earth Planetary Interiors, 143-144, 497-506, 2004.*

Kondo, T., E. Ohtani, N. Hirao, T. Yagi, T. Kikegawa, Phase transitions of (Mg,Fe)O at megabar pressures, *Phys. Earth Planet. Interiors, 147, 201-2134, 2004.*

Kung, J., B. Li, T. Uchida, Y. Wang, D. Neuville, and R. C. Liebermann, In situ measurements of sound velocities and densities across the orthopyroxene->high-pressure clinopyroxene transition in MgSiO3 at high pressure, *Phys. Earth Planet. Interiors, 147, 27-44, 2004.*

Kurashina, T., Hirose, K., Ono, S., Sata, N., Ohishi, Y., Phase transition in Al-bearing CaSiO3-rich perovskite: implications for seismic discontinuities in the lower mantle, *Physics of the Earth and Planetary Interiors, 145, 67-74, 2004*.

B. Li, J. Kung, R.C. Liebermann, Modern techniques in measuring elasticity of Earth materials at high pressure and high temperature using ultrasonic interferometry in conjunction with synchrotron X-radiation in multi-anvil apparatus, , *Physics of the Earth and Planetary Interiors, Volume 143, Issue 1-2 (2004), Pages 559-574,*

B. Li, J. Zhang, Pressure and temperature dependence of elastic wave velocity of MgSiO3 perovskite and the composition of the lower mantle, *Physics of the Earth and Planetary Interiors, Volume 151, Issue 1-2 (2005), Pages 143-154,*

L. Li, D. Weidner, P. Raterron, J. Chen and M. Vaughan, Stress measurements of deforming olivine at high pressure, *Physics of the Earth and Planetary Interiors*, *Volume 143, Issue 1-2 (2045), Pages 357-367.*

K.D. Litasov, E. Ohtani, Phase relations in hydrous MORB at 18-28 GPa: Implications for heterogeneity of the lower mantle, *Physics of the Earth and Planetary Interiors*, *Volume 150, Issue 4 (2005), Pages 239-263.*

C.A. McCammon, D.J. Frost, J.R. Smyth, H.M. Laustsen, T. Kawamoto, N.L. Ross and P.A. van Aken
Oxidation state of iron in hydrous mantle phases: Implications for subduction and mantle oxygen fugacity, *Physics of the Earth and Planetary Interiors*, *Vol. 143-144, Pages 157-169 (2004).*

S. Merkel, H.R. Wenk, P. Gillet, H.K. Mao and R.J. Hemley
Deformation of polycrystalline iron up to 30 GPa and 1000 K, *Physics of the Earth and Planetary Interiors, 145, pp 239-251 (2004)*

Ohtani, E., K. Litasov, T. Hosoya, T. Kubo and T. Kondo
Water transport into the deep mantle and formation of a hydrous transition zone *Physics of The Earth and Planetary Interiors*, *Volumes 143-144*, *15 June 2004*, *Pages 255-269*

S. Ono, T. Kikegawa, T. Iizuka, The equation of state of orthorhombic perovskite in a peridotitic mantle
Composition to 80 GPa: implications for chemical composition of the lower mantle. *Physics of the Earth and Planetary Interiors*, *Volume 145, Issue 1-4 (2004), Pages 9-17.*

Shieh, S. R., T. S. Duffy, and G. Shen, Elasticity and strength of calcium silicate perovskie at lower mantle pressures, *Phys. Earth and Planetary Interiors, 143, 93-105, 2004.*

J.R. Smyth, C.M. Holl, D.J. Frost, S.D. Jacobsen, High pressure crystal chemistry of hydrous ringwoodite and water in the Earth's interior, *Physics of the Earth and Planetary Interiors, 143-144, 47-56, 2004.*

T. Yagi, K. Okabe, N. Nishiyama, A. Kubo, and T. Kikegawa, Complicated effects of aluminum on the compressibility of silicate perovskite, *Physics of The Earth and Planetary Interiors*, *Volumes 143-144*, *15 June 2004*, *Pages 81-91*

MOST CITED PAPERS

Farewell To Ann Lattimore

After 27 years of splendid administrative service to the Mineral Physics Institute at Stony Brook, including service to CHiPR from 1991-2002 and COMPRES from 2002-2007, Ann Lattimore retired on November 1 and will move to Florida to be near her brother and sisters.

To honor her service and send her on her way, the faculty, staff and students of the Mineral Physics Insititute and the Department of Geosciences held two events:

October 30: A wine and hor d'oeuvres reception in the MPI/COMPRES office suite.

October 31: A luncheon at the Mirabelle French restaurant in St James.

One of the gifts to Ann at the reception was an album of messages and photos from friends and colleagues throughout the world of mineral physics, including many of you who took the time to write.

Thank you, Ann

At the luncheon, we surprised Ann with a credit voucher for airfare from Florida to Colorado in June 2008, when she will be a guest of COMPRES at our 2008 Annual Meeting at the Cheyenne Mountain Resort. However, do NOT expect to see her sitting at the registration table.

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