

**HIGH PRESSURE COLLABORATIVE ACCESS TEAM**

at the Advanced Photon Source

GEOPHYSICAL LABORATORY, Carnegie Institution of Washington

# Review of HPCAT Project

## June 22-23, 2016

**Bldg. 434 Conference Room  
Advanced Photon Source  
Argonne National Laboratory**

HPCAT is supported by DOE-NNSA under Award No. DE-NA0001974 and DOE-BES under Award No. DE-FG02-99ER45775, with partial instrumentation funding by NSF.





### Questions for the Principal Investigators

- 1) Describe the scope and work breakdown structure of HPCAT, including roles and responsibilities of key personnel and the executive committee (EC).
- 2) Summarize the funding structure for HPCAT, including a “level of effort” summary of other funds that support the sector.
- 3) Summarize the profile of CAT users. Describe the balance between beamline staff and user by research project or capability.
- 4) Provide an update on the governance model as a condition of the current solicitation.
- 5) Describe HPCAT’s strategy for addressing changes to the sector due to the APS Upgrade.
- 6) Highlight the involvement of PhD students and post-docs when designing and conducting experiments or in theoretical/computational efforts specifically those activities that prepare them for potential national laboratory careers. Highlight recent (under the current cooperative agreement) publications, talks and awards.

**At the end of the review, please provide a CD/flash drive to all Reviewers and NNSA staff containing all talks from the review.**

### Guidance for Review Panel Members

- 1) Does the sector management and infrastructure properly enable the NNSA laboratories ability to meet programmatic needs?
- 2) Is the sector addressing the key scientific and technical challenges that it agreed to address (as per the summary of the technical proposal)? Is it addressing these challenges in a time frame commensurate with the solicitation award term?
- 3) Has the sector met all operating and management requests as a condition of the cooperative agreement?
- 4) Is there an appropriate balance between facility users and beamline staff? Do technical and programmatic resources appear to be utilized correctly?
- 5) What is the technical significance of recent (under the current agreement) contributions to the community as represented by publications, talks and awards? Please highlight outstanding contributions?
- 6) Any additional recommendations are encouraged.



# HPCAT Review

Date: **June 22-23, Wednesday – Thursday, 2016**

Location: **Building 434 at the Advanced Photon Source, Argonne National Laboratory, 9700 S. Cass Ave, Argonne, IL 60439 (near HPCAT beamlines)**

	<b>Day One - June 22, Wednesday</b>	
7:30 A.M.	<i>Meet at Guest House Lobby, Carpool to HPCAT</i>	
7:30	<i>Registration - Breakfast</i>	<i>HPCAT Bldg-434</i>
8:00	Welcome APS Director, Dr. Stephen Streiffer APS Deputy Director, Dr. George Srajer	<i>HPCAT 434 Conference Rm</i>
8:10	Executive session	<i>Review panel</i>
8:40	HPCAT Overview A synchrotron facility for high-pressure research	<i>Guoyin Shen</i>
9:20	CDAC science	<i>Stephen Gramsch</i>
9:45	UNLV science	<i>Andrew Cornelius</i>
10:10	<i>Break</i>	
10:25	LLNL science	<i>William Evans</i>
10:50	LANL science	<i>Nenad Velisavljevic</i>
11:15	Users' science	<i>Maddury Somayazulu</i>
11:35	Users' science	<i>Jeff Pigott</i>
11:55	Users' science	<i>Bianca Haberl</i>
12:15	<i>Lunch</i>	<i>HPCAT 434</i>
1:15 P.M.	HPCAT beamlines and support equipment	<i>Stanislav Sinogeikin</i>
1:45	Beamline scientist reports (15 min each) <i>High-pressure x-ray diffraction – Jesse Smith</i> <i>In situ laser heated diamond anvil cell – Yue Meng</i> <i>High-pressure x-ray spectroscopy – Yuming Xiao</i> <i>Studies of high-pressure liquids – Yoshio Kono</i> <i>High-pressure single crystal x-ray diffraction – Dmitry Popov</i> <i>Interface at high P-T - Changyong Park</i>	<i>HPCAT 434 Conference Rm</i>
3:15	<i>Break</i>	
3:40	HPCAT Upgrade opportunity	<i>Guoyin Shen</i>
4:10	Executive session	<i>Review Panel</i>
5:10	Q & A	<i>Review Panel + HPCAT Management Team</i>
5:30	<i>Posters, refreshment</i>	<i>HPCAT Beamlines</i>
7:00	<i>Dinner</i>	<i>Local restaurant</i>

	<b><i>Day Two, June 23 Thursday</i></b>	
8:00 A.M.	<i>Meet at Guest House Lobby, carpool to HPCAT</i>	
8:00	<i>Breakfast</i>	<i>Building 434 (HPCAT)</i>
8:30	Executive session	<i>HPCAT 434 Conference Room</i>
9:00	HPCAT Tours	<i>HPCAT Beamlines</i>
11:00	Tele-conference with Carnegie Institution's President, Dr. Matthew Scott	<i>HPCAT 434 Conference Rm</i>
11:15	Executive session	<i>HPCAT 434 Conference Rm</i>
12:15	Review panel summary	<i>HPCAT 434 Conference Rm + HPCAT Management Team</i>
12:45	<i>Adjourn (box lunch provided)</i>	

## Review Panel Members

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Joe Kindel, NNSA

Staci Brown, NNSA

John Benage, Sandia National Laboratory

John Sarrao, Los Alamos National Laboratory

Choong-Shik Yoo, Washington State University

Hector Lorenzana; Lawrence Livermore National Laboratory

Christian Mailhot, Sandia National Laboratory

Steve Sterbenz, Los Alamos National Laboratory

## Presenters

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1. Guoyin Shen, HPCAT, Carnegie Institution of Washington
2. Stephen Gramsch, CDAC, Carnegie Institution of Washington
3. Andrew Cornelius, University of Nevada, Las Vegas
4. William Evans, Lawrence Livermore National Laboratory
5. Nenad Velisavljevic, Los Alamos National Laboratory
6. Maddury Somayazulu, Carnegie Institution of Washington
7. Jeffrey Pigott, Case Western Reserve University
8. Bianca Haberl, Oak Ridge National Laboratory
9. Stanislav Sinogeikin, HPCAT, Carnegie Institution of Washington
10. Jesse Smith, HPCAT, Carnegie Institution of Washington
11. Yue Meng, HPCAT, Carnegie Institution of Washington
12. Dmitry Popov, HPCAT, Carnegie Institution of Washington
13. Yuming Xiao, HPCAT, Carnegie Institution of Washington
14. Yoshio Kono, HPCAT, Carnegie Institution of Washington
15. Changyong Park, HPCAT, Carnegie Institution of Washington

## Posters for 2016 NNSA review

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### HPCAT Posters

1. High pressure studies with X-rays
2. Diamond anvil cell (DAC)
3. HPCAT overview
4. HPCAT science highlights 2015-16 (1)
5. HPCAT science highlights 2015-16 (2)
6. HPCAT user groups in 2016
7. 16-BM-B: a white X-ray beamline for Paris-Edinburgh press and Laue diffraction techniques (Y. Kono, et al.)
8. Paris-Edinburgh press program: Science highlights (Y. Kono et al.)
9. High pressure Laue diffraction at 16-BM-B beamline (D. Popov et al.)
10. 16-BM-D: Micro XRD and XAS Beamline (C. Park et al.)
11. 16-BM-D Science Highlights (D. Popov, C. Park et al.)
12. 16-ID-B: Micro-focused X-ray Diffraction Under Extreme Conditions (Y. Meng, J. Smith et al.)
13. 16-ID-B: Advances in High Pressure Melting Research (R. Hrubciak, Y. Meng et al.)
14. Kinetics of Phase Transitions under Rapid Compression (C. Lin et al.)
15. 16-ID-D: X-ray Spectroscopy Beamline at HPCAT (Y. Xiao, P. Chow et al.)
16. 16 IDD Science Highlights: X-ray Emission Spectroscopy on Lanthanides and Actinides (Y. Xiao et al.)
17. Laser Drilling and Micromachining System at HPCAT (R. Hrubciak et al.)
18. Online Temperature Control at HPCAT (S. Sinogeikin et al.)
19. Support Equipment at HPCAT: Optical Systems (S. Sinogeikin et al.)
20. Online Pressure Control at HPCAT (S. Sinogeikin et al.)

### User science posters

21. Chain breakage in liquid sulfur at high pressures and temperatures (L. Liu et al., GL-CIW / HPCAT).
22. Containment System for Experiments on Radioactive and Other Hazardous Materials in a Paris-Edinburgh Press (M. Jacobsen and N. Velisavljevic, LLNL).
23. Equation of state measurements by radiography provide evidence for a liquid-liquid phase transition in cerium (M. Lipp et al., LLNL).

24. High Pressure Seebeck Coefficient and Thermal Property Measurements on Thermoelectrics (*J. Baker et al., UNLV*).
25. Nanoarchitected materials composed of fullerene-like spheroids and disordered graphene layers with tunable mechanical properties (*Z. Zhao et al., HPCAT-CIW*).
26. Structural and Chemical Response of Actinide Materials to Ionizing Radiation (*C. Tracy et al, Stanford*).
27. Mapping the P-T Stability of Energetic Materials (*R. Chellappa et al., LANL*).
28. Irreversible Xenon Insertion into a Small-pore Zeolite at Moderate Pressure and Temperatures (*D. Seoung et al., Yonsei U./LLNL/HPCAT*).
29. Structural and electronic ground state of heavy alkalis at high pressure (*G. Fabbri et al., APS/WSU*).
30. Anomalous Compressibility Effects and Superconductivity in 1-2-2 Iron-Based Superconductors Under High Pressures (*W. Uchoy et al., U. Alabama / LLNL / ORNL*).
31. Singly Bonded Layered Polymeric Nitrogen (LP-N) (*D. Tomasino et al., WSU*)
32. P-T pathways and martensitic transition of lithium isotopes (*M. Dunuwille et al., U. Utah*).
33. Micro-diffraction mapping of complex high-P,T synthesis: discovery of Fe<sub>5</sub>O<sub>6</sub> (*B. Lavina and Y. Meng, UNLV / HPCAT*).
34. High-Pressure Synthesis of Open-Framework Materials For Energy-Related Applications (*S. Stefanoski, GL-CIW*).
35. High-Temperature High-Pressure Phase Diagram of Gadolinium Studied with Boron-Doped Heater Anvils (*J. Montgomery et al., U. Alabama / LANL*).
36. Shear Softening in Low-Spin Fe<sub>7</sub>C: Hidden Carbon in Earth's Inner Core (*B. Chen et al., U. Michigan / APS*).
37. Are the 4f electron(s) driving the high-pressure behavior of the cerium oxides Ce<sub>2</sub>O<sub>3</sub> and CeO<sub>2</sub>? (*M. Lipp et al., LLNL*).
38. 4f Metals under Compression: Are the f-electrons playing any part in the high pressure behavior? (*M. Lipp et al., LLNL*).
39. Pressure-tuned mixed valence in topological Kondo insulator SmB<sub>6</sub> (*N. Butch et al., U. Maryland / NIST / LLNL*).
40. Pressure-dependent Isotopic Composition of Iron Alloys (*A. Shahar et al., GL-CIW*).
41. Valence changes in YbFe<sub>2</sub>Ge<sub>2</sub> and YbR<sub>2</sub>Al<sub>10</sub> (R = Ru and Os) heavy fermion compounds studied by high pressure inelastic x-ray scattering (*R. Kumar et al., UNLV*).

## HPCAT Staff



Guoyin Shen, Director



Stanislav Sinogeikin, Associate Director



Paul Chow, Beamline Scientist



Yue Meng, Beamline Scientist



Changyong Park, Beamline Scientist



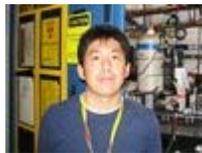
Daijo Ikuta, Beamline Scientist



Dmitry Popov, Beamline Scientist



Jesse Smith, Beamline Scientist



Yoshio Kono, Beamline Scientist



Yuming Xiao, Beamline Scientist



Freda Humble, Project Administrator



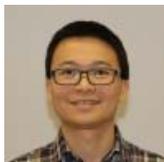
Curtis Kenney-Benson, Beamline Assoc.



Eric Rod, Technician



Arun Bommannavar, Beamline Control



Binyang Hou, KETEP Postdoc



Ross Hrubciak, Postdoctoral Associate



Cheng Ji, BES Postdoc



Chuanlong Lin, Postdoctoral Associate



Jianjun Ying, BES Postdoc

