**COMPRES Beamline Scientist Annual Report 2016 to 2017**

**Dr. Haiyan Chen**

**APS 6BM-B Large Volume Press Beamline**

**Geoscience Department, Stony Brook University**

I am a lead Beamline Scientist fully supported by COMPRES, working for APS 6BM-B Beamline run by Stony Brook University. From October 2017 to September 2018, 6BM-B station executed ~52% of total APS beamtime, of which 87.4% was allocated to 38 user proposals. The setup and development time was about ~ 13%, slightly up compared to last year as activity on developing new cell assemblies picks up. During this period, the availability of ultrasonic sound velocity measurement to the general user community was enthusiastically received, resulting in multiple publications. However, due to DOE/NNSA funding withdraw suffered by a few of our key user groups, we did experience the drop of unique user numbers. Fortunately, the affected PIs are getting new funding and will all come back for next run. We expect 6BM-B Beamline user community to grow with time.

As the only onsite beamline scientist, I do all I can to keep the operation of the beamline safe and efficient, to comply with APS and ANL safety regulations, and to educate users on how to work safely. I keep myself available to users all the time, keep constant communication with APS safety staff, and make sure standard operation procedures are up to date.

My duties as an administrator and operator of 6BM-B cover every aspect of a beamline operation and user service. One of my most important duties, however, is to make the beamline operation stable and efficient. Close interactions with user community, regular upkeep of essential equipment maintenance and service, constant development and perfection of procedures are all critical to ensure the satisfaction of 6BM-B users.

In the following sections, my activities are listed and the way I divide my time is indicated.

**User service (50%)**

Administered safety related APS required Sector Orientation to every new user

Helped users with proposals and ESAFs in APS system

Worked with APS safety staff and affected users closely during APS pause

Shipped and received materials, cell parts, tools from APS to and from users and vendors

Handled all the paper work, coordination, and execution of Yale RDA (Rotational Drickamer Apparatus) equipment installation and shipment from APS to Yale University

Taught / assisted users with boron epoxy cell fabrication, cell assembly, press operation, alignment, calibration, data collection and analysis

Troubleshot hardware and software problems

Responded to users’ various needs onsite or online at any time

Communicated users’ opinion of beamline to Stony Brook group

Assisted APS general users from 6BM-A Beamline

**Beamline management and operation (25%)**

Maintain press, tooling, optical system, slit, and detectors at optimum conditions

Restore systems after a blow-out, or Yale’s RDA experiment

Order supplies, such as cell parts, anvils, tools, and chemicals

Fulfill APS safety requirement of the laboratory and beamline

Review user proposals

Work with APS and Stony Brook group on beamtime allocation

Work with 6BM-A Station and users for beamtime scheduling

**Instrument development (25%)**

Worked closed with users on 3 mm anvil assemblies for regular deformation or sound velocity measurements at higher pressures

Designed and acquired cell assemblies 6 mm anvils from Kurt Leinenweber’s shop.

Got anvil rings machined for 6 mm diamond anvils and readied for testing.

Communicated with users who are interested in lower pressure deformation experiment. Offered to test 6 mm anvil with real samples from interested users.

Acquired new jigs for boron epoxy cell fabrication

Designed jigs for mounting ultrasonic transducers

Co-designed Co57 sources manipulator with an engineer from Yale group. The manipulator was fabricated by Yale machinist.

Installed, tested, and utilized the Co57 sources manipulator at 6BM-B Beamline

Reduced the EDXRD background at high energy side; enabled the RDA experiment on MgO at high shear stress.

**Improvements made**

Energy dispersive diffraction background was significantly reduced by elimination of Co57 source for Yale RDA experiments

**Beamline Proposals to 6BMB**

GUP# 61111: TiO2 and Ga2O3 Nanostructure Assemblies under high temperature and high pressure: A Nanostructure evolution and phase stability study

**Publications / Presentation**

1. Cheung, S. N. C., Weidner, D. J., Li, L., Meredith, P. G., Chen, H., Whitaker, M. L., Chen X., Stress distribution during cold compression of a quartz aggregate using synchrotron X-ray diffraction: observed yielding, damage and grain crushing, ***J. Geophys. Res. Solid Earth****,* 122 (4), 2724-2735, **2017***.*
2. Chen H.Y., Whitaker L. M., Baldwin K. J., Huebsch W.B., Vaughan M. T., Weidner D. J., COMPRES Multi-Anvil Facility at Beamline 6BM-B of the Advanced Photon Source, COMPRES Meeting, New Mexico, July 2017.
3. YT Zou, Y Li, HY Chen, D Welch, YS Zhao, BS Li, “Thermalelasticity and anomalies in the pressure dependence of phonon velocities in niobium”, *Applied Physical Letters*, 112 011901 2018
4. CSN Cheung, DJ Weidner, L LI, PG Meredith, HY Chen, ML Whitaker, XY Chen, “Stress Distribution During Cold Compression of Rocks and Mineral Aggregates Using Synchrotron-based X-Ray Diffraction”, *JOVE*, 135, 2018, Doi: 10.3791/57555
5. F Bejina, M Bystycky, N Terće, ML Whitaker, HY Chen, "Bulk modulus of Fe-rich olivines corrected for non hydrostaticity*",* [*Comptes Rendus Geoscience*](https://www.sciencedirect.com/science/journal/16310713), <https://doi.org/10.1016/j.crte.2018.06.002>

**6BMB Users assisted by PI’s name and institute**

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| Name | Institution |
|  |  |
| Donald Weidner | Stony Brook University |
| Li Li | Stony Brook University |
| Richard Triplett | Stony Brook University |
| Matthew Whitaker | Stony Brook University |
| Alvin James | Stony Brook University |
| See Nga Cecilia Cheung | Stony Brook University |
| Melissa Sims | Stony Brook University |
| Melinda Rucks | Stony Brook University |
| Paul Raterron | Brown University |
| Caleb Holyoke | Akron University |
| Leif Tokle | Brown University |
| Pamela Burnley | University of Neveda at Las Vegas |
| Shirin Kaboli | University of Neveda at Las Vegas |
| Yuegao Liu | Xian Center of Geological Survey, China |
| Wendan Wang | University of Neveda at Las Vegas |
| Liping Wang | University of Neveda at Las Vegas |
| Pei Wang | University of Neveda at Las Vegas |
| William Duram | Masschusetts Institute of Technology |
| Lars Hansen | Oxford University |
| Kathryn Kumamoto | Standford University |
| Catherine Goddard | Oxford University |
| David Goldsby | University of Pennsylvania |
| Christopher Thom | University of Pennsylvania |
| David Wallis | Utrecht University |
| David Kohlstedt | University of Minnesota |
| Jennifer Girard | Yale University |
| Yanjun Xiao | Yale University |
| Awar Mohiuddin | Yale University |
| Gabriel Guanmesia | Delaware State University |
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