

In-Situ Studies of Rock Deformation Science Workshop

Jan 18 – 19, 2021 (Live presentations and discussion)

Jan 20 – 22, 2021 (Online viewing of presentations)

Jan 22, 2021 (Final discussion on scientific goals)

The main goals of this Science Workshop are: 1) Integration of beamline technologies and experimental rock deformation; 2) Identify outstanding questions and future research directions. We anticipate several white papers on new research visions based on community input after the workshop.

Organizers:

Pamela Burnley, Haiyan Chen, Mark Rivers, Donald Weidner, Matthew Whitaker, Yanbin Wang (Chair)

Agenda (all times listed are EST)

Jan 18, 2021 (Monday)

1:00 - 1:10 pm: Intro (Wenlu Zhu, U. Maryland)

Tutorials (Chair: Yanbin Wang)

(25 min presentations with 5 min for discussion)

1:10 – 1:40 pm: Introduction to Synchrotron Radiation (Mark Rivers, GSECARS)

1:40 – 2:10 pm: X-ray diffraction: EDXD v. ADXD; single crystal v. polycrystal (Peter Eng, GSECARS)

2:10 – 2:40 pm: X-ray tomography: absorption, phase contrast, diffraction (Mark Rivers, GSECARS)

2:40 – 3:10 pm: X-ray spectroscopy techniques (Matthew Newville, GSECARS)

3:10 – 3:30 pm: Break

In-situ experimental techniques (Chair: Pamela Burnley)

(25 min presentations with 5 min for discussion)

3:30 – 4:00 pm: In-situ deformation: high-pressure devices (Yanbin Wang, GSECARS)

4:00 – 4:30 pm: In-situ deformation: stress and strain measurement with x rays (Donald Weidner, Stony Brook)

4:30 – 5:00 pm: Acoustic velocity and elasticity measurements using ultrasonics: basic principles (Matthew Whitaker, Stony Brook)

5:00 – 5:30 pm: High-energy x-ray diffraction: multigrain stress tensor in deforming polycrystals (Darren Pagan, Penn State)

5:30 – 5:40 pm: Break

5:40 – 6:30 pm: Q&A; discussion (Chair: Donald Weidner)

Jan 19, 2021 (Tuesday)

Data analysis – from theory to practice (Chair: Mark Rivers)

(25 min presentations with 5 min for discussion)

1:00 – 1:30 pm: Elastic plastic self-consistent modeling of diffraction data (Pamela Burnley, UNLV)

1:30 – 2:00 pm: Finite strain elastic-viscoplastic self-consistent modeling of polycrystal deformation (Nadege Hilaiet, U. Lille)

2:00 – 2:30 pm: XRD based texture analysis (Lowell Miyagi, U. Utah)

2:30 – 2:50 pm: Break

Current applications (Chair: Matthew Whitaker)

(15 min presentations with 10 min for discussion)

2:30 – 2:55 pm: TBA (Caleb Holyoke, U. Akron)

2:55 – 3:20 pm: In-situ shear deformation in Rotational Drickamer Apparatus: applications of synchrotron techniques to understand rheological properties of minerals (Jennifer Girard, Yale)

3:20 – 3:45 pm: Experiments with time as a variable (Donald Weidner, Stony Brook)

3:45 – 4:10 pm: Applications of ultrasonic measurements to acoustoelastic properties (Taryn Traylor, UNLV)

4:10 – 4:30 pm: Break

4:30 – 4:55 pm: Acoustic emission combined with deformation: transformational faulting and deep earthquakes (Timothy Officer, GSECARS)

4:55 – 5:20 pm: Tomography combined with deformation: quantitative characterization of microstructure during brittle faulting (Wenlu Zhu, U. Maryland)

5:20 – 6:20 pm: General discussion (Chair: Donald Weidner)

Jan 22, 2021 (Friday)

Virtual meeting discussion (Chair: Wenlu Zhu)

1:00 – 5:00 pm

Questions and wish lists of new science of rock deformation with synchrotron techniques

Research visions, feasibility, and implementation

Establish subgroups for different scientific topics pertinent to ISRD research

Products: to draft a 3-page document for each research vision by Feb 15, 2021.