

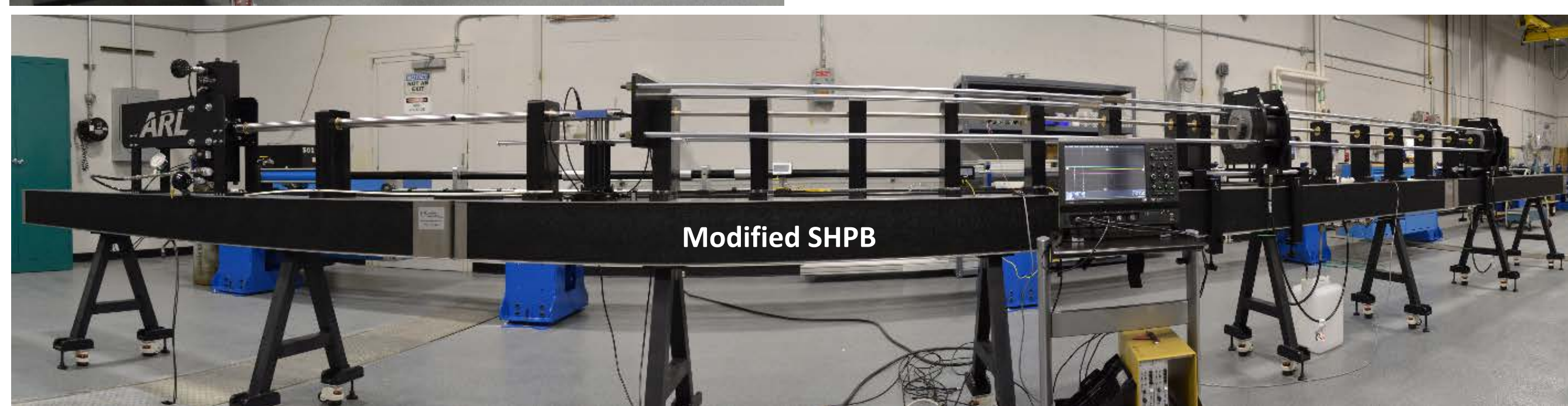
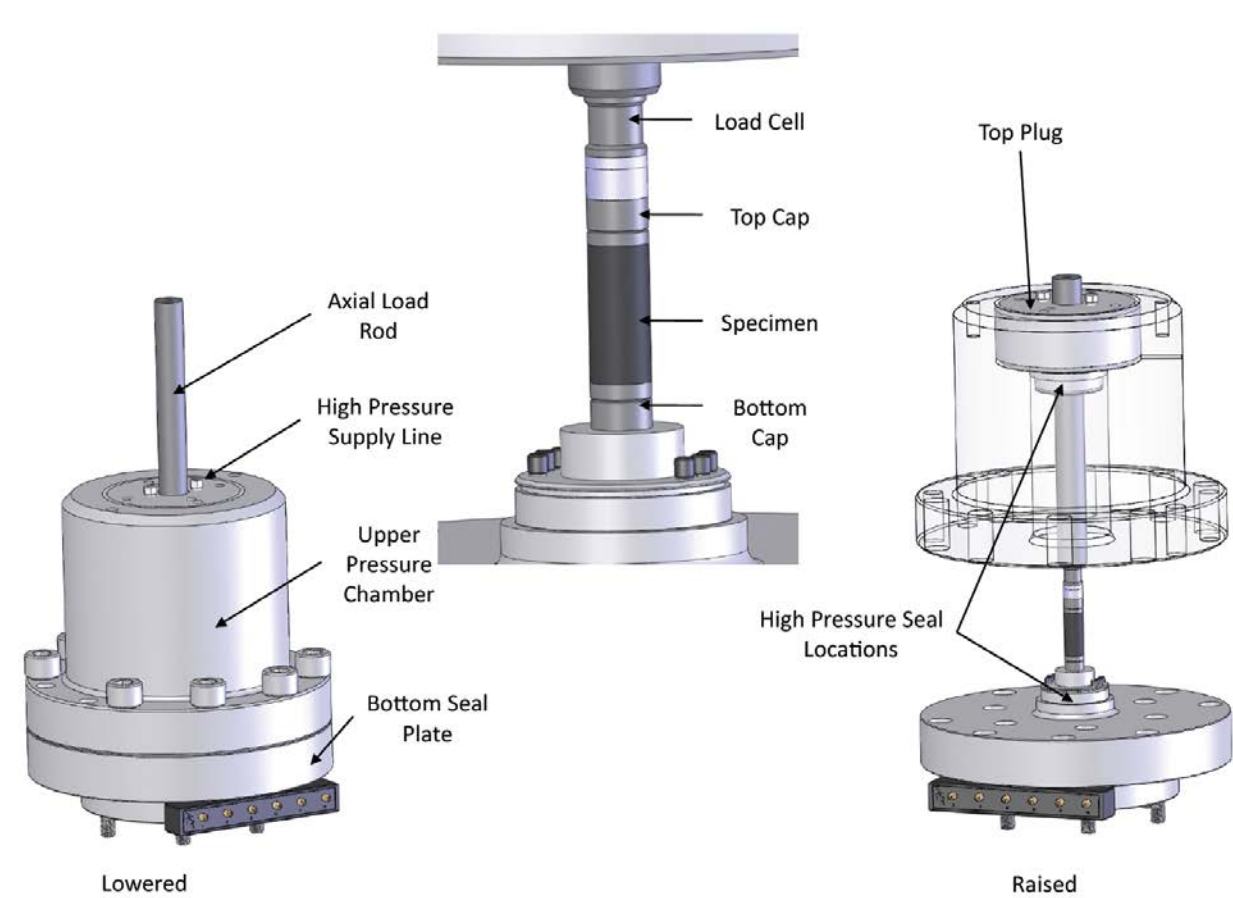
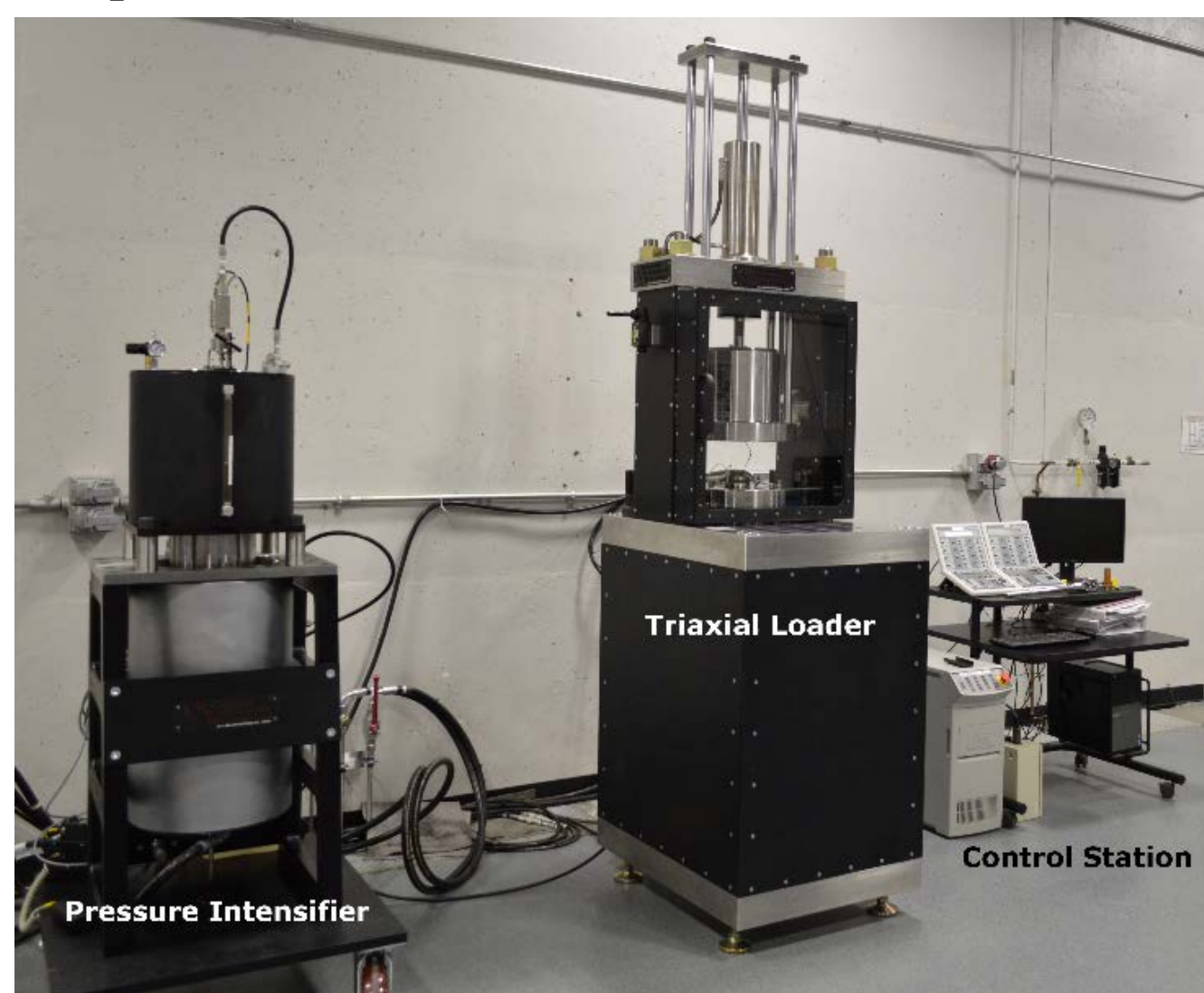
S&T Campaign: Materials Research
High Strain Rate & Ballistics
Ceramics & Transparent

Timothy Walter
 (410) 306-0186
 timothy.r.walter3.civ@mail.mil



Research Objective

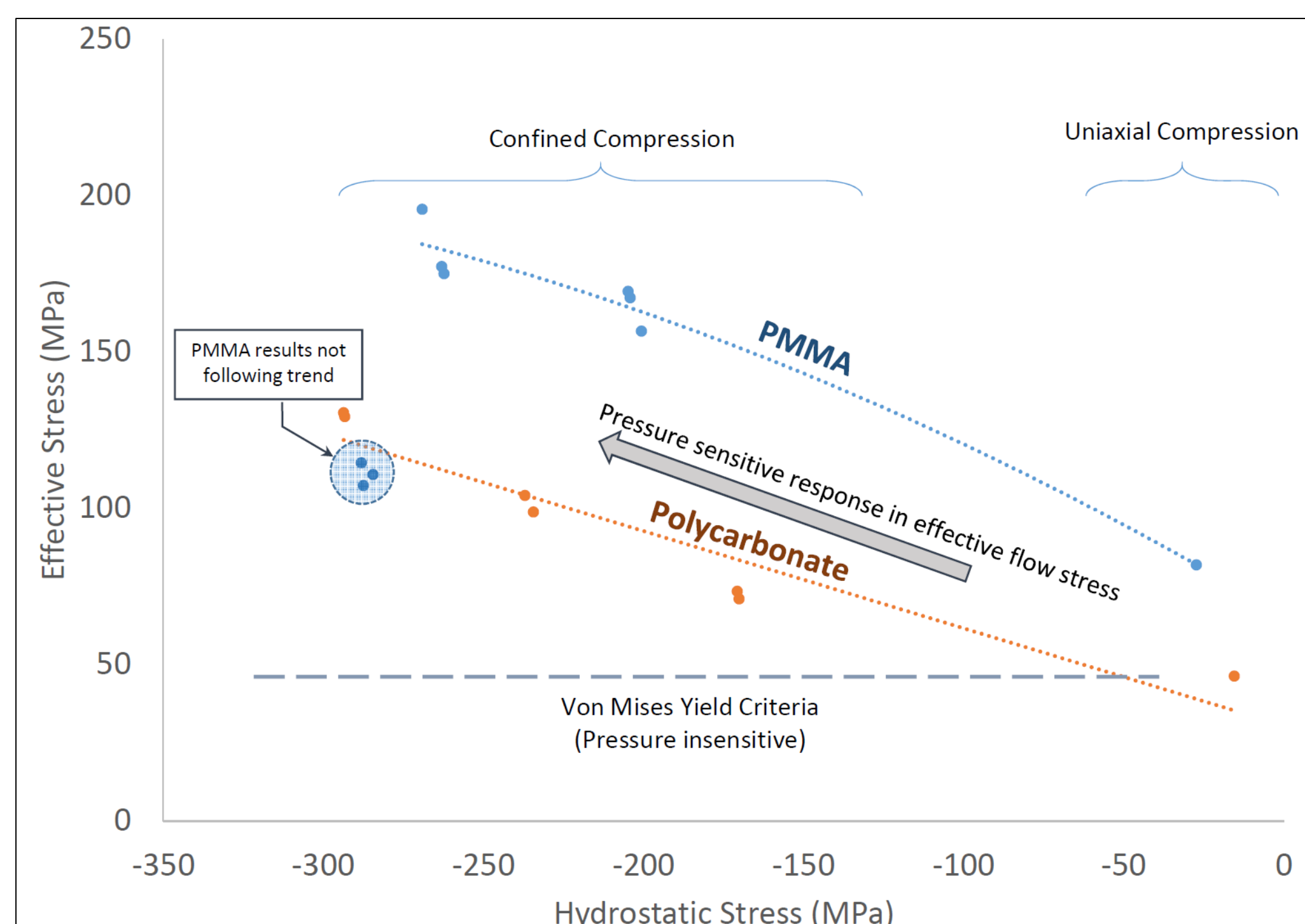
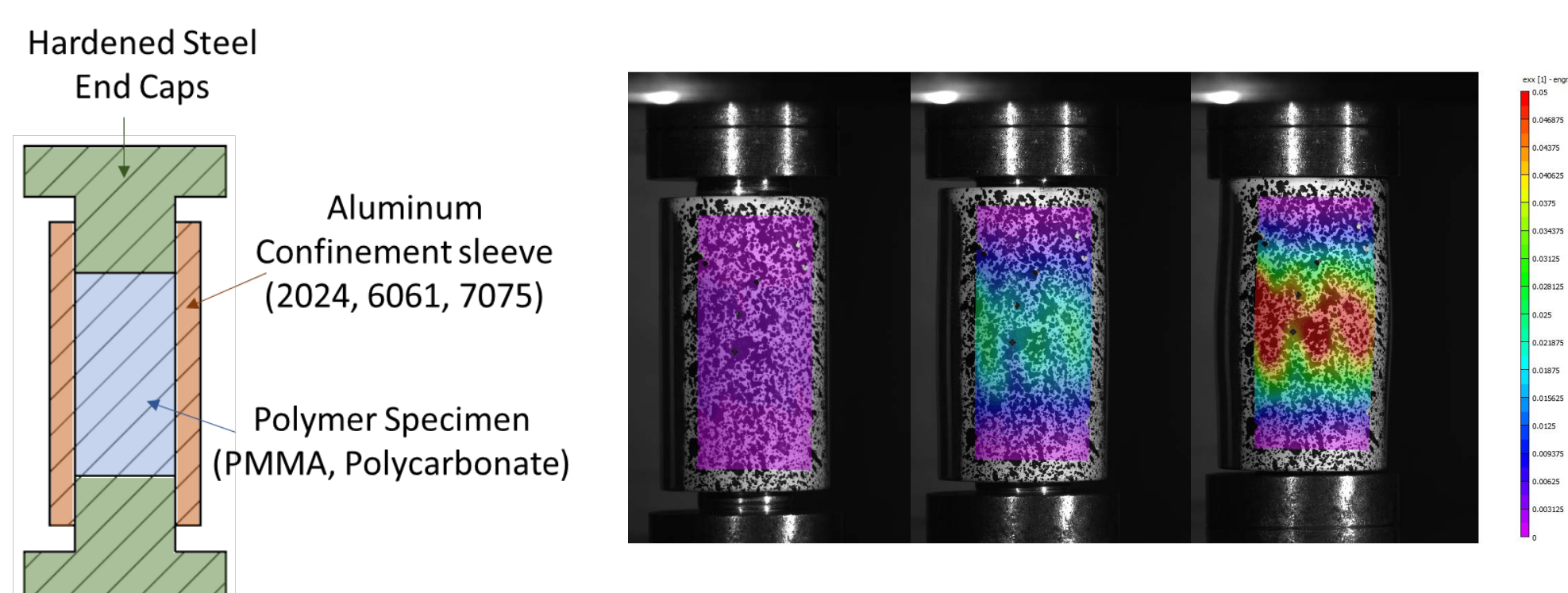
- Characterize the relationship between pressure temperature and loading rate on the mechanical deformation of materials
- Identify key deformation mechanisms and develop material models to capture pressure-dependent phenomena



Tri-axial Confinement facilities

Challenges

- Current methods use elastic-plastic ring confinement in which complex analysis is required to accurately determine hydrostatic stress
- This results in a continuously evolving state of hydrostatic confinement making interpretation of the results challenging and often misleading



Example of preliminary results using current test methods

ARL Facilities and Capabilities Available to Support Collaborative Research

Current multi-axial loading facilities

- Quasi-Static Tri-axial Confinement system for compression testing with up to 200 MPa confining pressure
- Dynamic Tri-axial Confinement system using split Hopkinson pressure bar with 200 MPa confining pressure
- Systems include temperature control to study thermal effects from -25 to 70 °C

Support Equipment & Facilities

- Standard mechanical testing facilities for quasi-static testing of materials
- Long split Hopkinson pressure bar for intermediate rate compression testing of polymer materials
- HBM high speed data acquisition systems with up to 8 channels and 100MS/s
- Digital image correlation for full field strain measurements including ultra high speed stereoscopic system capable of 5M fps
- μ CT facility for characterizing internal damage/fracture
- Access to HPC with commercial and laboratory codes including Abaqus, LS-Dyna, Alogra, and Sierra for FEA model development
- 3 inch keyed single stage gas gun for impact and shock testing
- OMAX MicroMAX water jet for precision fabrication of small test specimens from difficult to machine materials



Support Equipment currently available within ARL-WMRD

Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Researchers with interest or experience in pressure-dependent testing and modeling of materials
- Multi-axial tensile test facilities
- In-situ measurement techniques for confined compression, e.g. in-situ spectroscopy.