

Enhanced Oil Recovery and Water Management

• Enhanced Oil Recovery Methods

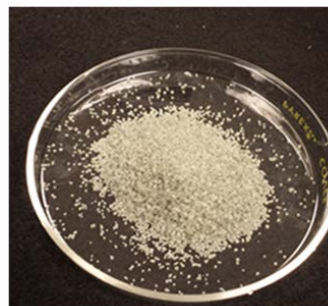
- Conformance control to reduce water production using preformed particle gels.
- Chemical EOR methods, including polymer flooding, polymer-surfactant flooding, MEOR (biosurfactant), and Wettability alteration for carbonate reservoirs.
- CO₂ and CO₂ foam flooding

• Multiple Phase Flow in Unconventional Resources

- Characterize Fluid flow behavior using micro- and nano-fluidic chips
- Characterize shale and tight gas rocks

• Geological Carbon Storage

- Develop methods to improve carbon storage efficiency in mature oilfields.
- Develop methods to maintain wellbore integrity and control leakage.



Novel Particle Gels for Extremely Heterogeneous Reservoir Conformance Control

Enhancing oil and gas recovery from existing reservoirs while protecting environments by developing new recovery methods and/or removing current technical bottlenecks.

Keywords

- Water management, Enhanced Oil Recovery (EOR), Conformance Control, Hydrogel, Particle Gels, Unconventional, Multiphase Flow, Nano-fluidics

Recognitions

- SPE Mid-Continent North America Regional Distinguished Achievement Award for Petroleum Engineering Faculty
- Outstanding Technical Editor, SPE Journal 2016.
- S&T Outstanding Teaching Award, 2014, 2015.



PoC: Baojun Bai, Professor,
Lester R. Birbeck Endowed Chair
Email: baib@mst.edu
Phone: 573-341-4016
Web: www.mst.edu/~baib

Funding

Department of Energy, ACS Petroleum Research Fund, PetroChina, Conoco-Philips, Occidental Company, New Wantong Oilfield Chemicals

Secure and Smart Cyber-Physical Systems

Cyber-Physical Systems (CPS)

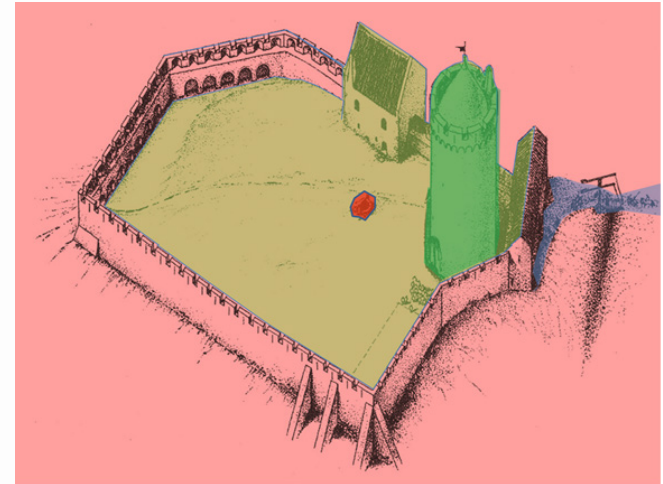
- Large complex distributed Critical Infrastructures
- Ensure correctness through distributed invariant monitoring

Security

- Mitigate cyber-physical attacks
- Determine a unified cyber-physical information flow model to determine potential attack vectors

Smart Living

- Develop Sustainable Cyber-Physical living environments
- Develop Privacy and Security for smart living environments



Security needs to move beyond the Fortress Mentality of Firewalls

PoC: Bruce McMillin, Associate Dean,
College of Engineering and Computing
Professor of Computer Science
ff@mst.edu, <http://mst.edu/~ff>
@bmcmillinSandT



Funding

- National Science Foundation, National Institute of Standards and Technology

Keywords

- #CyberPhysicalSecurity, #Information Assurance, #SmartLiving, #Invariants, #CriticalInfrastructure

Recognitions

- Podcast: [Cybersecurity “How We Manage Stuff”](http://djaghe.com)
<http://djaghe.com>, July, 19, 2016
- OpEd: [Moving beyond medieval cybersecurity, St. Louis Post Dispatch](http://www.postdispatch.com), Oct 30, 2015
- [IEEE Computer Society Board of Governors](http://www.ieee.org)

Infrastructure Renewal and Sustainable Materials for Civil Engineering Applications

Structures / High Performance Concrete Materials

- High strength concrete (HSC), High strength-self consolidating concrete (HS-SCC), Ultra high performance concrete (UHPC), High volume fly ash concrete (HVFAC).

Fiber-Reinforced Polymers (FRP) in Structural Applications

- FRP, Fiber reinforced cementitious matrix (FRCM), Steel reinforced polymers (SRP), Hybrid composite systems.

Structural Health Monitoring and Load Testing of Bridges

- Use and implementation of sensors for monitoring and load testing including vibrating wire strain gauges, themistors, LIDAR, and high precision surveying systems.

Structural Hardening and Blast Mitigation

- Development of systems for blast mitigation and structural hardening.

Use of advanced composites for rehabilitation and new material development for sustainable construction



PoC: John J. Myers, Ph.D. P.E., Associate Dean,
College of Engr. and Computing
Professor of Civil, Arch. And Envr. Engr
jmyers@mst.edu, <http://mst.edu/~jmyers>



Funding

- US Department of Transportation, Federal Highway Transportation, Missouri Department of Transportation, National Science Foundation, Air Force Research Laboratory, Department of Homeland Security, Army Research Laboratory.

Keywords

- #HPC, #HSC, #HS-SCC, #UHPC, #HVFAC, #FRP, #FRCM, #SRP, #SHM, #Blast Mitigation, #Infrastructure Renewal, #Rehabilitation.

Recognitions

- Award: ASCE Professional Recognition Award, 2014.
- Award: ACI EAC Committee Member of the Year Award, 2010.
- Award: Society of Military Engineers (SAME) Award, 2010.
- Fellow: ACI, ASCE, TMS.

Glass Science and Technology

Spectroscopic Studies of Glass Structure

- Utilize many tools, including Raman, NMR spectroscopies, neutron and x-ray diffraction techniques, to characterize the molecular-level structures of oxide glasses

Corrosion Studies of Glass

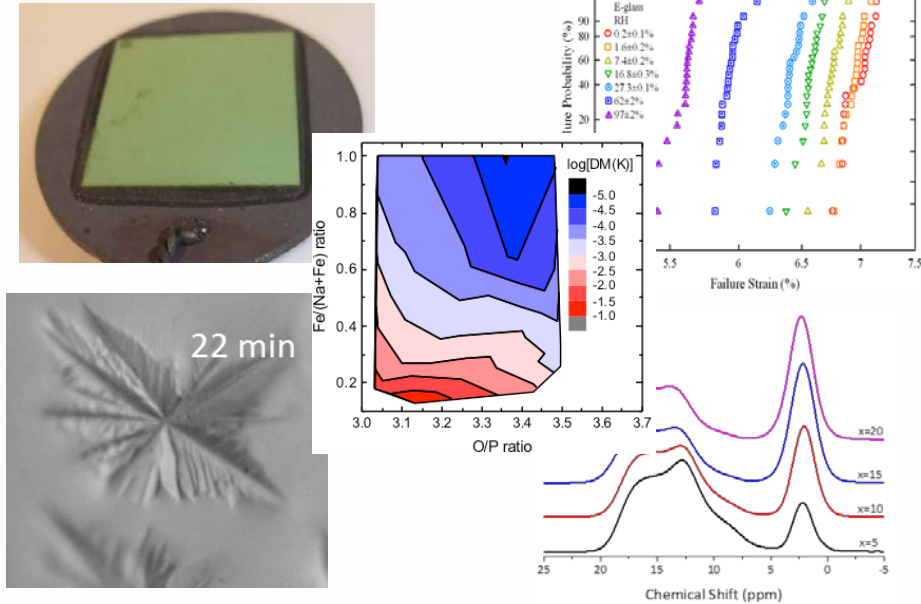
- Characterize and model interactions between oxide glasses and aqueous environments to develop new compositions for a variety of applications, including bioactive glasses and glasses for nuclear waste encapsulation

Designing Glasses for Engineering Applications

- Developing oxide glass compositions that can be used to seal solid oxide fuel cells, apply as protective coatings for metals, used as optical filters or substrates, processed using additive manufacturing techniques, etc.

Aging and Fatigue Studies of Glass

- Use mechanical tests and surface characterization tools to understand how environment controls glass strength



Relate composition to atomic structure in order to design new glasses for engineering applications

PoC: Richard K. Brow, Interim Dean,
College of Engineering and Computing
Curators' Distinguished Professor,
Materials Science and Engineering
brow@mst.edu; http://mse.mst.edu/faculty_staffandfacilities/brow/



Recent Funding

National Science Found, Dept of Education, Dept of Energy,
Lawrence Livermore Lab, Sandia National Labs, PPG Ind.

Keywords

- #GlassScience, #Corrosion, #Bioglass, #GlassStructure, #WasteVitrification, #OpticalGlass, #SealingGlass

Recognitions

Award: 2016 N.F. Mott Award, J. Non-Cryst. Solids

Award: 2004 George W. Morey, glass science

Service: 2012-13 President of the American Ceramic Society

Fellow: American Ceramic Soc., Soc. Glass Technology (UK)