An Overview of Capabilities at the NIST Center for Neutron Research

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7th International Workshop on Sample Environment at Neutron Facilities  
Sydney, Australia
- The Tool Belt
- The Right Tool for the Right Job
- News
- Planning
- Safety vs. Results
- R&D
The Tool Belt

What Range?

- $0 \leq P \leq 2.5$ GPa
- $0 \leq B \leq 15$ T

- Furnaces
- Top Loading CCRs
- Closed-cycle Refrigerators
- LHe Cryostats
- $^3$He Systems
- Dilution Refrigerator

Temperature (K)

http://www.ncnr.nist.gov/equipment/ancequip.html
The Right Tool for the Right Job

What is important? At what instrument?

Temperature → Field (B, E) → Pressure → Flow → RH

Data Acquisition Time → Accuracy and Precision

Simultaneous Multi-Techniques

http://www.ncnr.nist.gov/equipment/ancequip.html
At what cost?
News

Site wide recovery system underway

Dil Fridge under high demand and working well

11.5 T wet magnet patient on intensive care

Dependable Dry 10T magnet

Newly commissioned SANS 1.5 cryostat

Plenty of work during long shutdown
Planning

Prior

Preparation
  ➢ Submission
  ➢ Review
    ✓ Scientific – national & international experts
    ✓ Technical & Safety Review (S.E.)
    ✓ Proposal Assessment Committee (PAC)

Preparation
  ➢ Scheduling
    ✓ User Office
    ✓ Instrument Scientists (S.E. consultation) (24 Hrs. prior)

Poor

Prevents

Arrival
  ➢ Completion
  ➢ Customer feedback

Performance

(S.E. consultation)

http://www.ncnr.nist.gov/
Reality

- Preparation
- Submission
- Review
  - Scientific – national & international experts
  - Technical & Safety Review (BYO S.E or n/a)
  - PAC (Proposal Calls for Ambient Conditions)
- Scheduling
  - User Office
  - Instrument Scientists
- Arrival
- Completion
- Customer feedback

http://www.ncnr.nist.gov/
Safety vs. Results

Stick to the plan

Slow down and be vigilant

I will NOT go above 1300°C!

Expansion ratios
- Nitrogen: 1 : 696
- Helium: 1 : 757
- Water: 1 : 1700

In doubt ask

50 psi
Or 50 bar?

Know your sample

Yes! My sample IS dry!
$^3$He Polarization

$^3$He program for scattering applications
SEOP lab

Currently available for 3-axis, reflectometry, and SANS

$\approx 20$ experiments/year
Computer Controlled Gas Handling Manifold

Pressures up to 200 bar
Resolution: 0.01% of F.S.
Accuracy: ±1% Reading
Flow restrictors to prevent gauge saturation, vacuum pump
Intrinsically safe wiring
Explosion proof enclosure, gauges and valves
Sample volume protected via expansion volume

Easy pull-down menus
Supports scripting for remote beam line experiments
Works either as a stand-alone program or in the background controlled by ICP
Expandable
Multi-stage SAmple Changer

Prototype:
6 Samples
253 K ≤ T ≤ 393 K
\[ tΔT = 100\, \text{K} : 1 \text{ min.} \, (0.25 \, \text{K acc.}) \]
\[ : 5 \text{ min.} \, (0.1 \, \text{K acc.}) \]
Receives pre-existing SANS demountable cells
Ease of sample change
Torlon vrs PTFE:

Thermal Conductivity  0.250 W/m-K
Deflection Temperature at 1.8 Mpa
PTFE:  93.3 °C
Torlon: 278 °C
SANS Rheometers

Rheology
- Couette Geometry
- Cone-Plate/Plate-Plate
- Torque Ranges
  - MCR501: 0.1 μNm – 230 mNm
  - MCR301: 0.1 μNm – 200 mNm
- Shear Stress: 0.5 mPa – 5.5 MPa

RheoSANS
- Couette Geometry
  - 1,3 and 2,3 planes
- Cups and Bobs from Titanium and Quartz
- Static SANS Cell
- Time Resolved Measurements

Contact Jeff Krzywon at jeff.krzywon.nist.gov
Sample Cans

Air sensitive/gas loading

$P_{\text{max}} = 5 \text{ bar (V)}$

$4 \text{ K} \leq T \leq 800 \text{ K}$

Heated gas line available for methane and CO$_2$

SANS Gas Adsorption

$P_{\text{max}} = 1,000 \text{ bar}$

$\text{LN}_2 < T < 350\text{K}$

Beam divergence angle $\theta \approx 20^\circ$

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