SUPPORT FACILITIES NEEDS FOR SOFT MATTER

Infrastructure: Needs & Requirements

HFIR

SNS



OAK RIDGE NATIONAL LABORATORY U. S. DEPARTMENT OF ENERGY



CSMB - Biological SANS at HFIR

- Bio-SANS station designed specifically for biology
 - Designed with community
 - Low background/high flux
 - Additional Shielding
 - Resolution d λ / λ ~20% (8-45%)
 - User friendly operation
- User Program, Infrastructure & Support
 - Laboratory for bio-sample preparation
 - DLAB H/D-labeling, isolation & characterization
 - Computational tools for structural biology
 - New SAXS and Light Scattering





A world class facility for the US user community.

Deuteration Laboratory

Central facility and user program for *in vivo* H-D labeling of macromolecules FY05 LDRD with Dale Pelletier (*Life Science Division*)

- Develop a Central Deuteration Laboratory dedicated to specific H/D labeling of cells, proteins, nucleic acids and other bio-molecules.
- Develop better and faster systems and methods to produce deuterium labeled biological macromolecules for the biology community
- Improving downstream technologies to exploit these reagents (including data collection and interpretation for neutron scattering)
- Train research students and staff in application of these powerful techniques

2005 - ORAU Visiting Scholar Program



JT-BATTELLE



Community Needs – Community Support

- Neutron Scattering for Chemistry and the Chemistry/Biology Interface
- Sample Environments for Neutron Scattering Experiments

http://www.sns.gov/jins/tallahassee_w orkshops_2003/workshops.htm



nber 23-25, 2003, Fiorida State University, Tallahassee, Florida

This workshop focuses on scientific grand challenges and the role neutrons can play in chemistry and of the chemistry biology interloce. Graduet extractin, positions and researchers who are new to neutron scottering are sepeciatly encouraged to participate. Attendees will som about applications of neutron scottering and speciatorscorp to structure and dynamics in:

- Catalysis, optical, electronic and magnetic materials; batteries; nanoporous solids
- Structure and dynamics of liquids, glasses, complex fluids, thir
- films, proteins, biomembranes and whale cells Molecular behavior under confinement/near interfaces
- Complex self-assembles of synthetic and biomaterials

This workshop is held in conjunction with the SENSE Workshop, Sample Environments for Neutron Scattering Experiments, on September 24-25. Together, the workshops will:



- Inform the chemistry and chemistry communities of opportunities—instrumentation and supporting facilities—currently promeed for the Spotiation Neutron Source (3N3) Solicit the community's lakas on the needs for instrumentation.
- Solid: the community's lates on the needs to instrumentation, detector development, and sample environment development to support neutron scattering experiments.
- Identify the tools needed and outline a path to realization via the formation of concept teams to develop science cases and unding proposal for



Instrumentation, detectors, sample environment and related laboratory facilities Tour of the National High Magnetic Field Laboratory B Pade session to show research ideas

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- Leading scientists from several communities speak about hot research topics with strong sample environment implications.
 Instrumentation experts give a workdwide overview of sample
 - visonment capabilities
- Discussion panels establish benchmarks for new sample environment development (all attendees encouraged to participate)

This workshop is held in conjunction with the NSFCHEMBIO Workshop -Neutron Scattering for Chemistry and the Chemistry/Biology Interface on September 23-25. Together, the workshops will

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Speakers	Program Committee	Contacts
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NSF CHEMBIO Sept. 25, 2003 Paul Butler & Joanna Krueger

• 1) X-ray scattering/reflectivity instrumentation on site at the neutron facility is essential

A) Reflectometer geometry (theta-theta diffractometer, Goebel mirrors and a scintillation detector)

B) Small-angle x-ray scattering

- 2) Significant laboratory space on the floor in close proximity to the instrument is critical
 - A) A full chemistry & soft matter laboratory in CLO
 - B) substantial amount of floor space be available around the sample area



Sense: Biological and Life Sciences David Worcester, Jim Torbet

Outline of Needs and Recommendations

- Deuteration (Essential)
- Relative Humidity (accurate measure, homogeneous)
- Sample changer 10-20 positions, horizontal.
- Hydrostatic Pressure. ~5kbar. Al or Ti,Zr AND sapphire
- Magnetic Field for orientation. ~10T (cryogen free?)
- Hydrodynamic shear for orientations and Rheology
- Pulsed Electric Fields for Rotational Diffusion
- Software Control (as part of data acquisition)
- Ventilation for organics in Reflectometry
- Langmuir Trough



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