SOFT MATTER INTERFACES (SMI)

BROOKHAVEN NATIONAL LABORATORY

NATIONAL SYNCHROTRON LIGHT SOURCE II

SCIENTIFIC SCOPE

Soft Matter Interfaces (SMI) is an undulator beamline at sector 12-ID providing world-leading capability to make discoveries in the ***structure, energetics, and assembly*** of soft materials, by focusing on the information best obtained at ***interfaces***. SMI will be unique in its support for Grazing Incidence SAXS, WAXS, and liquid interface scattering in the tender x-ray regime, enabling new contrast from P, S, K, and Ca species prevalent in soft- and bio-materials. The proposal to construct SMI was developed and supported by a community of over 300 synchrotron experts, users, and collaborators worldwide.

BEAMLINE CHARACTERISTICS

TECHNIQUES:

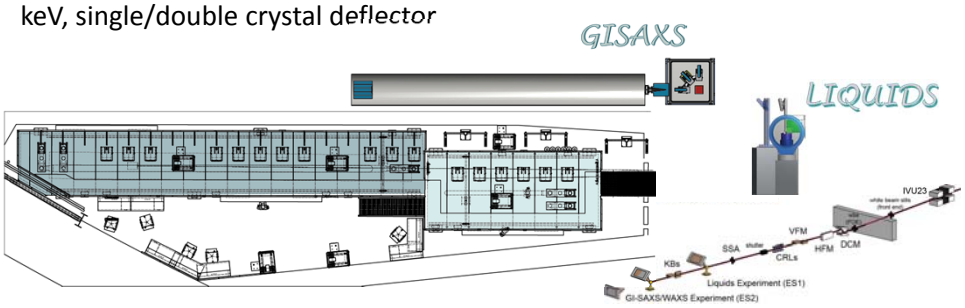
- Grazing-Incidence SAXS/WAXS
- Liquid Reflectivity and Diffraction
- Tender X-ray Scattering

ENDSTATION DETAILS:

- GI-SAXS/WAXS station: 2.1-24 keV, microbeam and low divergence modes, in-vacuum Pilatus detectors
- Liquids station: 25µm spot, 8-24 keV, single/double crystal deflector

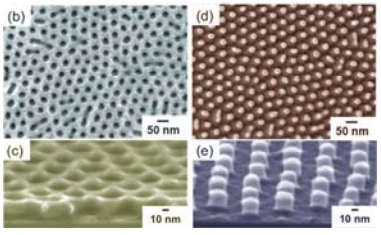
SMI at NSLS-II:

- Structure and assembly in Soft Matter: crucial knowledge for Energy and Environment
- Variable *q* range, beam properties, and sample geometries to measure from nanoscale to mesoscale
- Resonance from P, S, K, Ca: discover new structure-function relationships

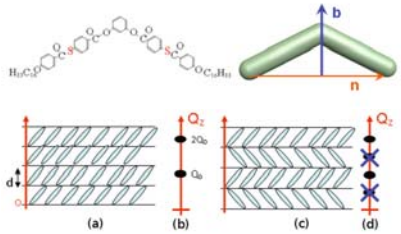


Two end-stations in-line with canted undulator beam source GISAXS/WAXS and Liquids experiments. The design enables future upgrade to fully canted build-out with two independent energy-tunable end-stations. Inboard branch shown.

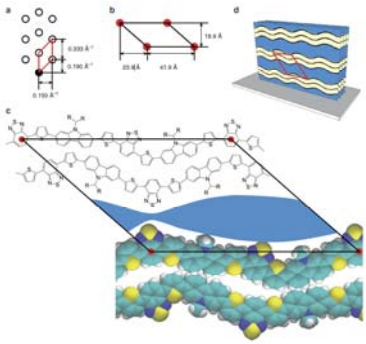
SCIENTIFIC APPLICATIONS



Molecular templates (above), liquids and wetting, hierarchical biomaterials – soft materials play crucial roles to advance technology. To create and control soft materials with new properties and functions, it is essential to probe structure, energetics, and assembly at solid and liquid interfaces. *Checco 2013*



Grazing-incidence small- and wide-angle x-ray scattering measures correlations of structures and superstructures, prevalent in active assemblies such as mechanical composites, biomaterials, and responsive phases such as liquid crystals (above). *Barois 2012*



Liquid crystals, molecular electronics, and photo-responsive organic films (above) will see use in energy and environmental applications when their synthesis, assembly, and electronic properties are mastered at nano and meso scales. *Lu 2012*

Overview

PORT: 12-ID
SOURCE: undulator (IVU23)
ENERGY RANGE: 2.1 – 24 keV
ENERGY RESOLUTION: $\Delta E/E = 10^{-4}$
SPATIAL RESOLUTION: 2.5 µm
CONSTRUCTION PROJECT: NEXT
BEAMLINE STATUS: Construction
AVAILABLE TO USERS: Spring 2017

Beamline Team

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Elaine DiMasi: lead beamline scientist
Mikhail Zhernenkov: beamline scientist
Warren Halbig: mechanical engineer
Amanda King: designer
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