

# USANS

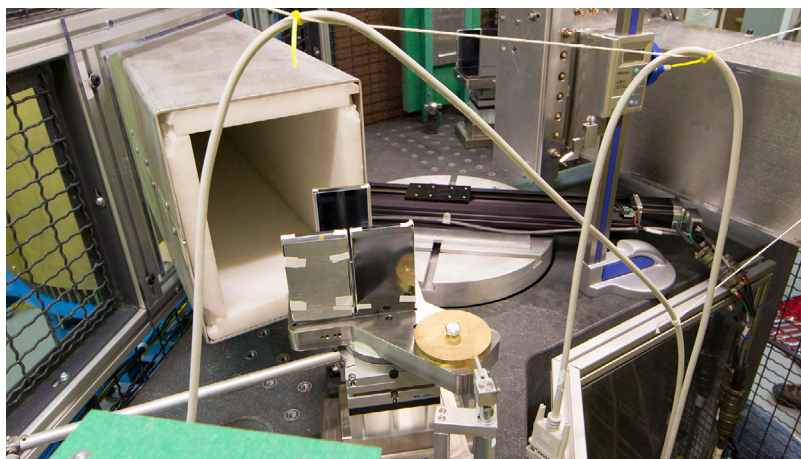
## Ultra-Small-Angle Neutron Scattering Instrument

Spallation Neutron Source

BEAMLINE

# 1A

The USANS instrument is designed for the study of hierarchical structures in natural and man-made materials. It can be considered an advanced version of the classical Bonse-Hart Double-Crystal Diffractometer (DCD), which, in contrast to its single-wavelength reactor-based analog, will operate with the discrete multiwavelength spectrum of Bragg reflections. The optical scheme of the USANS instrument is similar to that of the conventional Bonse-Hart DCD; however, the pulsed nature of SNS offers an opportunity to separate the orders of Bragg reflection in time space using the time-of-flight technique. Thus, the application of time-of-flight to the USANS technique allows the separation of data optimized for flux and the minimum accessible Q while removing one of the most significant contributions to the intrinsic instrument background.



Discrete multiwavelength spectrum created by a family of Bragg reflections.

### SPECIFICATIONS

Moderator	Decoupled poisoned hydrogen
Source-detector distance	30 m
Focusing	Copper mosaic Cu (111) crystals
Monochromator and analyzer	Si (220) channel-cut, triple-bounce crystals
Bragg angle	70°
Wavelength spectrum	4 Bragg reflections at 3.6, 1.8, 1.2, 0.9 Å
Q range	$1 \times 10^{-5} \text{ \AA}^{-1} < Q < 3 \times 10^{-3} \text{ \AA}^{-1}$

21-G02309/jdh Dec 2021

## APPLICATIONS

USANS provides a new way to solve a broad range of scientific problems such as

- Supramolecular structure of polymer blends
- Mesoscopic structure of natural composites
- Macroscale self-similarity of rocks
- Structure of granular powders
- Structure of colloidal crystals and alloys
- Morphology of colloidal reinforcing fillers
- Hydration of cement pastes
- Structure and morphology of complex fluids
- Aggregation in colloidal dispersions
- Rheology and morphology of hydrogels
- Self-assembly of polymers

### For more information, contact

Wei-Ren Chen, [chenw@ornl.gov](mailto:chenw@ornl.gov), 865.574.7979

Yingrui Shang, [shangy@ornl.gov](mailto:shangy@ornl.gov)

[neutrons.ornl.gov/usans](http://neutrons.ornl.gov/usans)



Managed by UT-Battelle LLC  
for the US Department of Energy