



## USANS – ULTRA-SMALL-ANGLE NEUTRON SCATTERING INSTRUMENT

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 Bense-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 Bense-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.*

### APPLICATIONS

Ultra-small-angle neutron scattering provides a new way to solve a broad range of scientific problems such as

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

### SPECIFICATIONS

Moderator	Decoupled poisoned hydrogen
Source-detector distance	30 m
Focusing premonochromator	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	$1 \times 10^{-5} \text{ \AA}^{-1} < Q < 5 \times 10^{-3} \text{ \AA}^{-1}$

Status: Available to users

### FOR MORE INFORMATION, CONTACT

Instrument Scientist: Ken Littrell, [littrellkc@ornl.gov](mailto:littrellkc@ornl.gov), 865.291.7583  
[neutrons.ornl.gov/usans](http://neutrons.ornl.gov/usans)