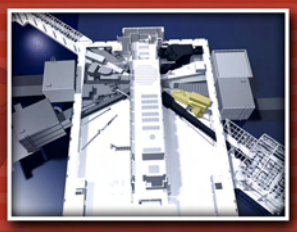
Instrument Fact Sheet

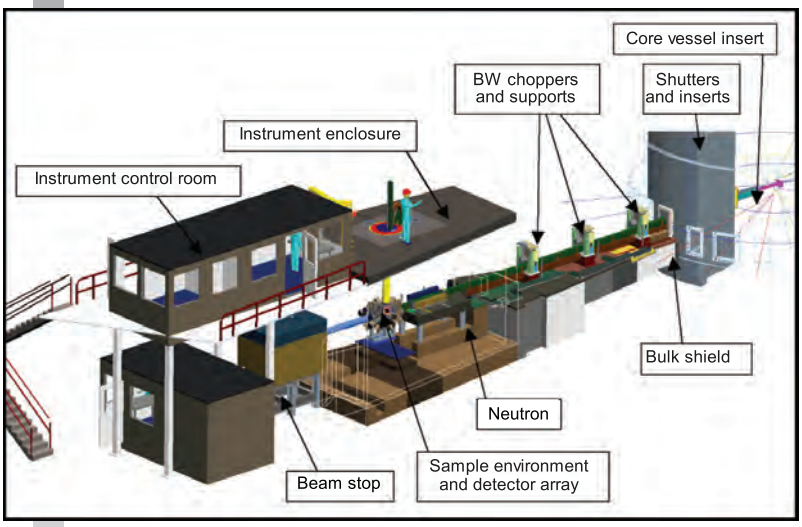
BEAM LINE 12

Spallation Neutron Source



TOPAZ – Single-Crystal Diffractometer

The TOPAZ Single-Crystal Diffractometer (SCD) is designed to perform elastic scattering experiments under controlled environmental conditions to probe material structures and responses. Use of the same single-crystal sample for X-ray and neutron diffraction was the guiding design principle of TOPAZ, a versatile and variable-environment SCD for neutron scattering. Data are collected on samples of between 0.001 and 0.1 mm^3, and expected average unit cell sizes are around 50 $Å^3$ for compounds of moderate complexity. The goal for TOPAZ is the capability to collect data in a matter of hours rather than days. Materials investigated include functional materials of the high-Tc superconductor perovskite family; magnetic superstructures in perovskites and spinels; the molecular basis of future high-density, three-dimensional storage materials; and catalytic precursors, metalhydrides, and organometallics. Options to polarize the neutron beam for magnetic scattering experiments are included, as well as the ability to record Bragg intensities and diffuse scattering at cryogenic and elevated temperatures. A polarized incident neutron beam and magnetic field option on the sample help scientists decipher complex and directional magnetism and magnetic transitions.



Specifications

Moderator	Decoupled poisoned hydrogen
Source-to-sample distance	18 m
Sample-to-detector distance, evacuated	39–45 cm
Sample-to-detector distance in air	39–45 cm, 60–80 cm
Initial angular detector coverage	4 sr
Optional angular detector coverage	9 sr
Detector pixel size	6.2×10^{-6} sr (1 mm)
Detector angles	0–180°
Wavelength bandwidth	3.35 Å
Frame 1	0.5–3.85 Å
Resolution	0.1%
Sample size	0.001 mm^3 < S < 1 mm^3
Divergence on sample	10 mrad < d < 25 mrad

Status:
To be commissioned in 2009

Applications

TOPAZ can address problems and greatly expand the range of materials explored in chemistry, earth sciences, materials science and engineering, solid-state physics, and biology. It can also assist in studies of therapeutics and medical compounds, such as aspirin and paracetamol, to show differences in hydrogen locations and bonding, helping scientists better understand a material's individual effectiveness.

For more information, contact

Instrument Scientist: Christina Hoffmann, hoffmanncm@ornl.gov, 865.576.5127
Scientific Associate: Matthew Frost, frostmj@ornl.gov, 865.576.2033

http://neutrons.ornl.gov/instrument_systems/beamline_12_topaz

SNS

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