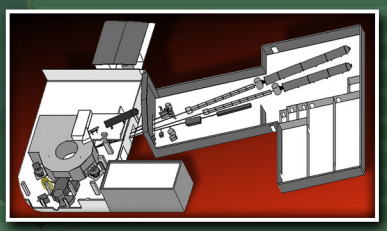
Instrument Fact Sheet

BEAM LINE **HB-2A**

High Flux Isotope Reactor



Neutron Powder Diffractometer

The Neutron Powder Diffractometer has a Debye-Scherrer geometry. The detector bank has 44 ^{3}He tubes, each with 12' Soller collimators. A germanium wafer-stack monochromator is vertically focusing and provides one of three principal wavelengths, depending on which reflection is in the diffracting condition: (113) 2.41 Å, (115) 1.54 Å, and (117) 1.12 Å. The takeoff angle from the monochromator is fixed at 90°, and the minimum peak full width at half maximum (FWHM) is 0.2°. There are two choices of premonochromator collimation (α_1 = 12' or open) and three choices of presample collimation (α_2 = 16, 21, or 31') that allow the operation of the instrument in high-resolution or high-intensity modes.

Applications

The HB-2A Neutron Powder Diffractometer is a workhorse instrument used to conduct crystal structural and magnetic structural studies of powdered and ceramic samples, particularly as a function of intensive conditions (T, P, H, etc.). Technologically important materials amenable to study by neutron powder diffraction include (but are not limited to) catalysts, ionic conductors, superconductors, alloys, intermetallic compounds, ceramics, cements, colossal magnetoresistance perovskites, magnets, minerals, waste forms, H-storage materials, thermoelectrics, zeolites, and pharmaceuticals. Powder diffraction data collected on this instrument are ideally suited for the Rietveld method. In addition to traditional crystal structural refinements, studies of phase transitions, thermal expansion, quantitative analysis, residual stress, and ab initio structure solution can be undertaken from the powder data. A full range of ancillary sample environments can be used, including cryofurnaces (4–800 K), furnaces (to 1800 K), cryostats (to 0.06 K), and cryomagnets (to 7 T).

Specifications

Beam spectrum	Thermal
Monochromator	Vertically focusing Ge (115)
Monochromator angle	$2\Theta_m = 90°$
Wavelengths	λ = 1.54 Å(115) 2.41 Å(113) 1.12 Å(117)
Sample angles	$0° < \omega < 360°$
Scattering angle	$2° < 2\Theta < 155°$
Collimations (FWHM)	Premonochromator (α_1): 12' or open (60' effective) Monochromator–Sample (α_2): 16', 21', or 31' Sample–detector (α_3): 12'
Detector bank	44 ^{3}He detectors
Beam size	25 x 25 mm^2 at sample position
Resolution	2.24 x 10^{-3} $\Delta d/d$

Status: Available to users

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