

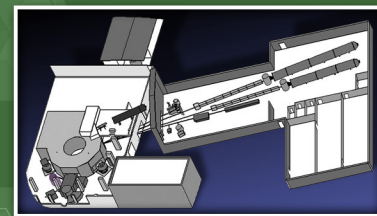
HIGH FLUX ISOTOPE REACTOR

INSTRUMENT

BEAM LINE

HB-2A

NEUTRON POWDER DIFFRACTOMETER



The Neutron Powder Diffractometer has a Debye-Scherrer geometry. The detector bank has 44 ^3He tubes, each with 12 ft 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 ($\alpha_1 = 12^\circ$ or open) and three choices of presample collimation ($\alpha_2 = 16, 21, \text{ or } 31^\circ$) 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	$2\theta_m = 90^\circ$
Wavelengths	$\lambda = 1.54 \text{ \AA} (115)$ $2.41 \text{ \AA} (113)$ $1.12 \text{ \AA} (117)$
Sample angles	$0^\circ < \omega < 360^\circ$
Scattering angle	$2^\circ < 2\theta < 155^\circ$
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 ^3He detectors
Beam size	50 x 25 mm ² at sample position
Resolution	$2.24 \times 10^{-3} \Delta d/d$

Status: Available to users

FOR MORE INFORMATION, CONTACT

Instrument Scientist: Clarina Dela Cruz, delacruzcr@ornl.gov, 865.241.2431

Instrument Scientist: Stuart Calder, caldersa@ornl.gov, 865.200.7775

neutrons.ornl.gov/hb2a

