

INSTRUMENT

BEAM LINE

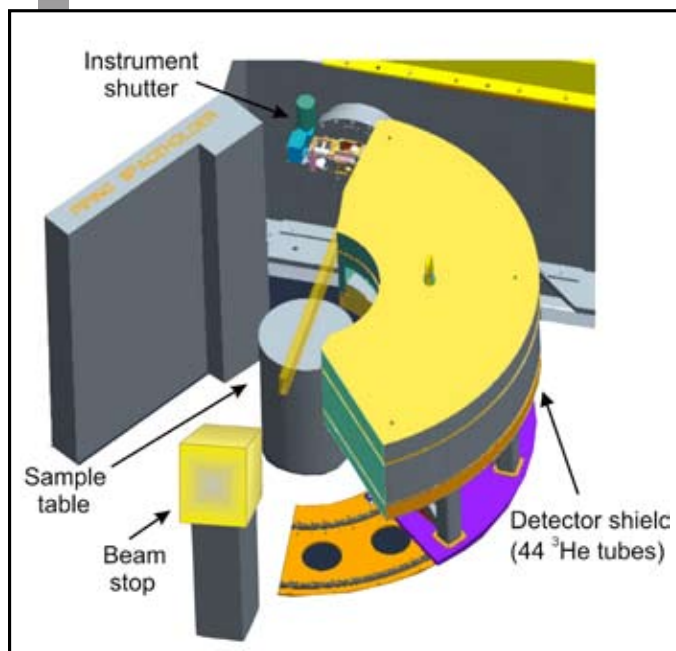
HB-2A

HIGH FLUX ISOTOPE REACTOR



NEUTRON POWDER DIFFRACTOMETER

The Neutron Powder Diffractometer has a Debye-Scherrer geometry. The detector bank has 44 ^3He tubes, each with 6' 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 ($\alpha_1 = 12'$ or open) and three choices of presample collimation ($\alpha_2 = 16'$, $21'$, or $31'$) that allow the operation of the instrument in high-resolution or high-intensity modes.

SPECIFICATIONS

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|---------------------|--|
| Beam spectrum | Thermal |
| Monochromator | Vertically focusing Ge (115) 20 |
| 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 | $0^\circ < 2\theta < 150^\circ$ |
| Collimations (FWHM) | $\alpha_1 = 12'$ or open $\alpha_2 = 16', 21', \text{ or } 31'$ |
| Detector bank | 44 ^3He detectors |
| Beam size | $25 \times 25 \text{ mm}^2$ at sample position |
| Resolution | $2 \times 10^{-3} \Delta d/d$ |

Status: In commissioning

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, 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 0.3 K), and cryomagnets (to 7 T).

FOR MORE INFORMATION, CONTACT

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http://neutrons.ornl.gov/hfir_instrument_systems/HB-2A.shtml



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