

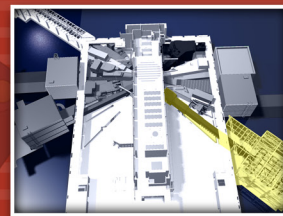
INSTRUMENT

BEAM LINE

11A

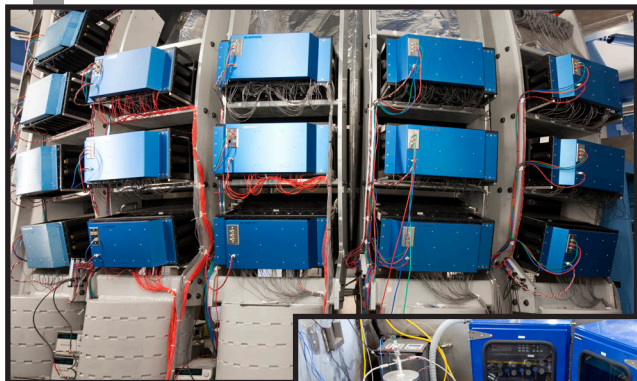
SPALLATION NEUTRON SOURCE

Fact Sheet



POWGEN – POWDER DIFFRACTOMETER

POWGEN is a general-purpose powder diffractometer useful for a wide range of structural studies. It can cover d-spacings from ~ 0.3 Å, or less, to 3 Å in a single measurement. Rietveld measurements for traditional neutron-size samples can be completed in a few hours, with a $<0.2\%$ resolution at short d-spacings and $<1\%$ resolution for nearly all d-spacings of interest. Alternatively, much of this resolution can be traded for intensity, making it possible to take shorter measurements while still maintaining good resolution. It



is also possible to collect data from much smaller samples with longer collection time. The adjustable bandwidth-limiting choppers allow for large variations in the incident wavelengths and pulse repetition rate. Insertable guide sections and the ability to trade resolution for intensity at the analysis stage allow users great latitude to optimize the data range, resolution, and statistical precision for each experiment.

APPLICATIONS

Scientific studies at this instrument encompass a wide range of novel materials. These include, but are not limited to, structural studies of magnetic materials such as high-Tc superconductors, metal-insulator phase transitions, charge and orbital ordering transitions, and molecular magnets. Additional possibilities include nonmagnetic materials such as zeolite and aluminophosphate frameworks; metals and semiconductors; dielectrics, ferroelectrics, and thermoelectrics; and ab initio structure solutions of complex polycrystalline materials such as pharmaceutical compounds. In addition, POWGEN is capable of acquiring refineable data sets in rapid data collection mode, making it an ideal instrument for parametric studies and time-resolved in situ studies of the electrochemistry of catalysts, ceramic membranes, hydrogen storage materials, and charging and discharging of battery materials.

SPECIFICATIONS

Moderator	Decoupled poisoned super critical H ₂
Source-to-sample distance	60 m
Sample-to-detector distance	2.5–4.5 m
Detector angular coverage	$30^\circ < 2\theta < 150^\circ$
Total detector coverage	6.9 m ²
Bandwidth	~ 1 Å
Frame 1	0.1–2.0 Å at 60 Hz 0.2–4 Å at 30 Hz
Frame 5	2.2–10.2 Å at 60 Hz
Resolution	$0.001 < \Delta d/d < 0.016$
Sample Environment	24 Sample changer: 12–300 K Orange cryostat: 2–300 K ILL furnace: 1200°C Gas atmosphere furnace (with RGA and pO ₂ sensor): 850°C

Status: Available to users

FOR MORE INFORMATION, CONTACT

Instrument Scientist: Ashfia Huq, huqa@ornl.gov, 630.986.7321

Instrument Scientist: Andrew Payzant, payzanta@ornl.gov, 865.235.4981

neutrons.ornl.gov/powgen



May 2012