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The Upgraded General Purpose Powder Diffractometer at IPNS-ANL. J.W. Richardson, Jr., E.R. Maxey, Y. Li, A. Huq, IPNS Div., Argonne National Lab., Argonne, IL USA

The General Purpose Powder Diffractometer (GPPD) at IPNS has been upgraded according to a new concept for neutron powder diffractometer design that combines in an optimal way the strengths of reactor-based angle-dispersive and pulsed-source time-of-flight instrument designs. The key to this performance is to combine a continuous detector bank, extending over a large solid angle from back scattering to forward scattering, with time focusing techniques that allow all scattered neutrons to be combined into a single histogram. Without changing any instrument hardware, performance can be software/electronically optimized with respect to resolution, count rate, and d-spacing range to match the experiment being performed. A ~20 times data rate increase is achieved in high intensity mode, where detectors covering a 75° 2-theta range are time-focused and summed. Changing chopper phasing allows the optimum resolution to be moved to d-spacings up to 6-8 Å for the study of larger unit cells, mixed phases, or subtle distortions.

The instrument now operates with: (1) a new Data Acquisition System capable of measuring full spectra for each detector and with EPICS-based process control, (2) one T0 and a frame-definition chopper providing wavelength-band selection and 15 Hz effective operation, (3) a 15 meter m=3 supermirror guide system with measured neutron gain factor >6 terminating 1m (top) and 2m (sides) from the sample position, (4) an incident flight pathlength of 25m (up from 20m) to reduce the moderator pulse-width contribution to peak shape resolution, and (5) no initial change in the L-CH4 moderator poisoning depth.

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