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Convergent Beam Neutron Crystallography. W.M. Gibson, J.M. Carpenter, H.H. Chen-Mayer, E.R. Maxey, D. F.R. Mildner, M.E. Miller, J.W. Richardson, A.J. Schultz, R. Youngman, X-Ray Optical Systems, Inc., 15 Tech Valley Dr. East Greenbush, NY 12061 USA.

Two monolithic polycapillary optics of different focal length and beam convergence are used to investigate the use of focusing lenses for the neutron convergent beam method for time-of-flight crystallography with a broad wavelength band. The lens of short focal length (15.5 mm) with a beam convergence of 16.8° ± 1.0° has a focal width of about 120 μm. For a single crystal sample of this diameter on a pulsed neutron source, this lens gives an integrated intensity gain of ~50 for a (020) Bragg peak in MnF_2 with 3.2 Å neutrons and a measured peak width (FWHM) of 4.5°. Further measurements on a powder diffractometer show that the expected diffracted beam intensities have gains as much as 500 for powder samples of this diameter. The degradation of resolution is minimized in the back scattering geometry. The intensity gains for the powder diffraction peaks increase with wavelength and closely follow the expected transmission of the optic as a function of wavelength.

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