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Precession Electron Diffraction. L.D. Marks, C.S. Own, Dept. of Materials Science and Engineering, Northwestern Univ., Evanston, IL 60201, W. Sinkler, UOP LLC, 25 East Algonquin Rd., Des Plaines, IL 60017.

The recently developed precession or Vincent-Midgley camera is an interesting concept which appears to circumvent many problems with dynamical diffraction of electrons for bulk crystallographic analyses. The basic idea of such a camera is to tilt the incident electron beam in a cone about a zone axis, and simultaneously descan the beam in the final diffraction pattern. The diffraction pattern obtained is then an integral over a range of different directions, similar to an x-ray precession camera. It appears that Direct Methods work well with diffraction data from bulk crystals obtained this way, for reasons which are not currently completely understood. We have implemented a version of the Vincent-Midgley precession camera within our UHV-transmission electron microscope and (more recently) on a JEOL 2000FX, and are also in the process of constructing a third camera. In addition to obtaining experimental data with these instruments, we have also performed full dynamical-diffraction simulations of the patterns via incoherent averaging of multislice calculations for conical illumination. Both the experimental and calculated data indicate that higher tilt angles are much better, and that the Blackmann approximation is not a particularly good approximation for the precession case. These and more result results will be described.

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