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Nanocrystal Phase Identification by Lattice Fringe Fingerprinting from High Resolution Transmission Electron Microscope Images RUBEN BJORGE, BJOERN SEIPEL, PETER MOECK, Portland State University, PHILIP FRAUNDORF, University of Missouri-St. Louis — Lattice fringe fingerprinting is a novel and powerful method of identifying and characterizing nanocrystalline structures or materials based on images from direct space high-resolution transmission electron microscopy (HRTEM). We examine Fourier transformed HRTEM images of nanocrystals in certain orientations (i.e. lattice fringes and cross fringes) in order to obtain a lattice fringe fingerprint plot. Such plots are used to identify a crystalline nanoparticle by comparing the experimental data with data that are derived from a comprehensive database. A lattice fringe fingerprint plot is similar to a classical X-ray powder diffractogram, but an important advantage is that the intersection angles of lattice fringes give us additional information. When transmission electron microscope image acquisition and data interpretation are automated and connected to a comprehensive database (such as our Nano-Crystallography Database, http://nanocrystallography.research.pdx.edu/), fringe fingerprinting will be able to compete with powder X-ray diffraction in identifying unknown nanocrystals on a routine basis.

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