
ABSTRACT

In conventional transmission electron microscopy (TEM), the image is taken from two-dimensional (2D) projection of a three-dimensional (3D) object; therefore, the spatial information in third dimension is hidden in 2D micrograph. Without series of image analysis and simulation the 3D spatial information cannot be extracted. One powerful technique to obtain 3D spatial information in TEM is electron tomography. The current highest resolution of electron tomography is 2.4 angstrom. However, even with this resolution the 3D atomic structure of nanoparticles cannot be fully revealed. It is difficult to achieve 3D atomic resolution with electron tomography because the 2D micrographs must be aligned with a spatial accuracy better than the imaged interatomic spacing. Here we demonstrate a model-free electron tomography technique for 3D imaging non-periodic structures containing defects. The technique employs intrinsic crystal features instead of extrinsic fiducial markers to achieve the alignment accuracy needed to reconstruct a crystal with atomic resolution. We apply it to determine the 3D geometry and atomic arrangements of a highly defective gold nanowire.

BIO

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