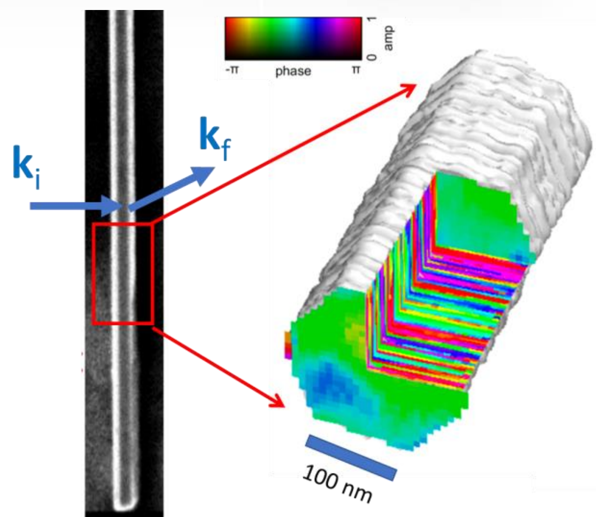
3D Nanoscale Imaging of Defects in a Nanowire



Multi-angle Bragg projection ptychography, in combination with coarse scanning measurements, allowed for structural investigation of a nanowire over three decades of length scale. (Left) a SEM image of a nanowire with diffraction geometry and (right) cutouts from 3D images sensitive to stacking defects.

Scientific Achievement

In a single nanowire, the 3D distribution of both strain and stacking defects was measured using coherent x-rays, revealing structural heterogeneity from nano- to micrometer scales.

Significance and Impact

Structural features that determine the performance of advanced optoelectronic nanodevices can be imaged by a new coherent x-ray Bragg ptychography method suitable for studies in operando.

Research Details

- NSLS-II's HXN beamline was used to measure nanodiffraction of a single InGaAs nanowire at two different Bragg peaks with different structural sensitivity.
- A new multi-angle Bragg projection ptychography method was used to make 3D images of the structure down to a scale of 3 nm.

M.O. Hill, I. Calvo-Almazan, M. Allain, M.V. Holt, A. Ulvestad, J. Treu, G. Koblmüller, C. Huang, X. Huang, H. Yan, E. Nazaretski, Y.S. Chu, G.B. Stephenson, V. Chamard, L.J. Lauhon, S.O. Hruszkewycz. *Nano Letters* **18(2)**,811-819 (2018).

Work was performed at Argonne and Brookhaven National Laboratories