NANODIFFRACTION

Nanodiffraction is a special form of convergent beam electron diffraction (CBED) in which the emphasis is on obtaining diffraction patterns from regions of the specimen about 1nm or less in diameter. Unless a field-emission gun (FEG) is used, the intensity in a beam 1nm in diameter is too small to be useful. Hence, nano-diffraction has been performed mainly in dedicated STEM instruments having cold FEG sources, although the newer TEMs with FEGs may also be used. Efficient two-dimensional detector systems and recording with TV or CCD cameras, as on our VG HB-5 STEM, are important.[1] Electron beam diameters may be as small as 0.2nm.

Possible Applications

- Structure analysis of very small particles (e.g. metal particles in catalysts[2,3])
- Studies of defects (e.g. twins and dislocations) and disorder in very small particles[4]
- Structure of individual defects in thin crystal foils[5]
- Determining local order in thin films of near-amorphous materials or disordered crystals[6]
- Determination of local symmetry within particular parts of a unit cell of a crystal or a defect[7]
- Combining local structure analysis with bright-field or dark-field STEM imaging or microanalysis by EELS and EDX with high spatial resolution or imaging with secondary or Auger electrons[8]

Specimen Requirements

Thin specimen foils or well-dispersed particles on thin film supports work best. Specimens should be cleaned to reduce contamination, e.g., by baking in air or vacuum, or use of plasma cleaner.

Suitable Microscopes

This technique is available on the following instruments:

- JEOL JEM 2010F

References

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