

APPLICATION NOTE

NCMN Central Facility for Electron Microscopy



Phase Identification Using Electron Diffraction By Dr. X.Z. “Jim” Li, NCMN Specialist

Selected-area-electron diffraction (abbreviated as SAED), is a crystallographic technique that can be performed with a transmission-electron microscope (TEM).

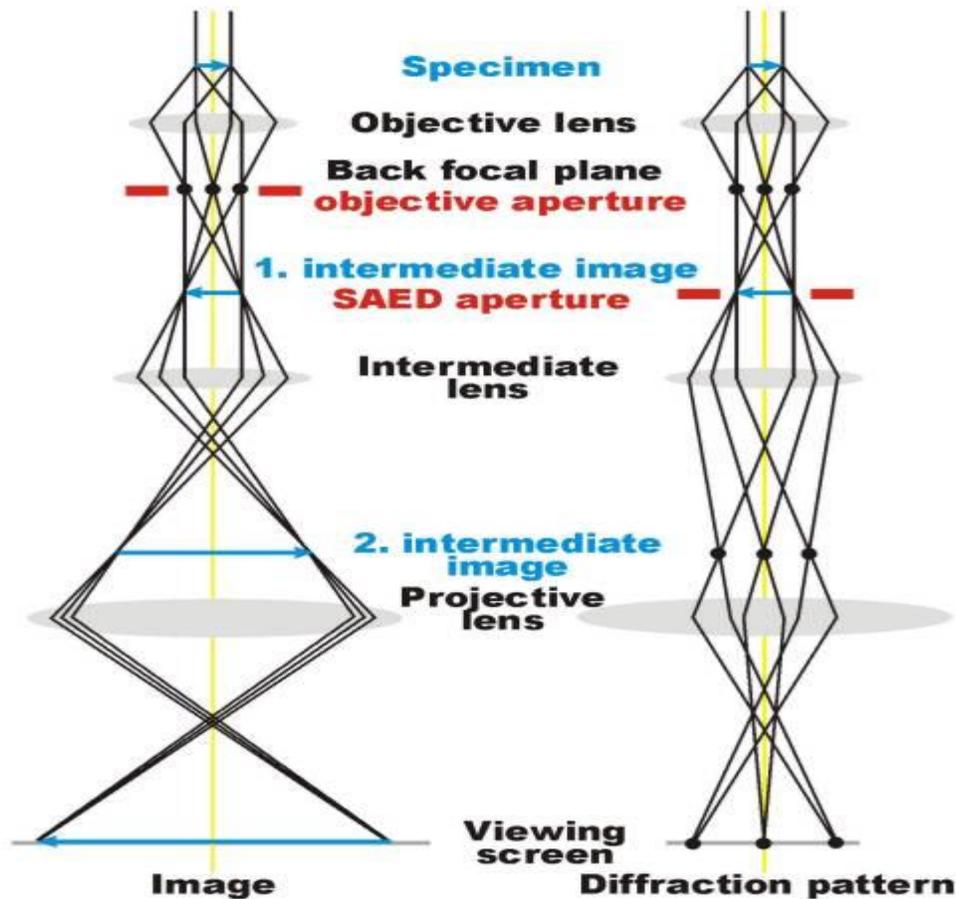


Figure 1. Ray diagrams of image mode and diffraction mode in a transmission-electron microscope.

In SAED an experimental electron diffraction pattern (EDP) is recorded from a thin specimen of a crystalline material, the main feature being a pattern of spots with various intensities.

A series of EDPs is obtained by tilting the specimen and then simulating the patterns from crystalline structures which are selected from a database of crystalline structures. If all the simulated EDPs match well with the experimental ones, we can confirm the crystal structure of the specimen under study.

An example is our recent work on the structural characterization of Pt-Bi thin films [1]. Experimental and simulated EDPs show the γ -PtBi₂ phase with a secondary PtBi phase.

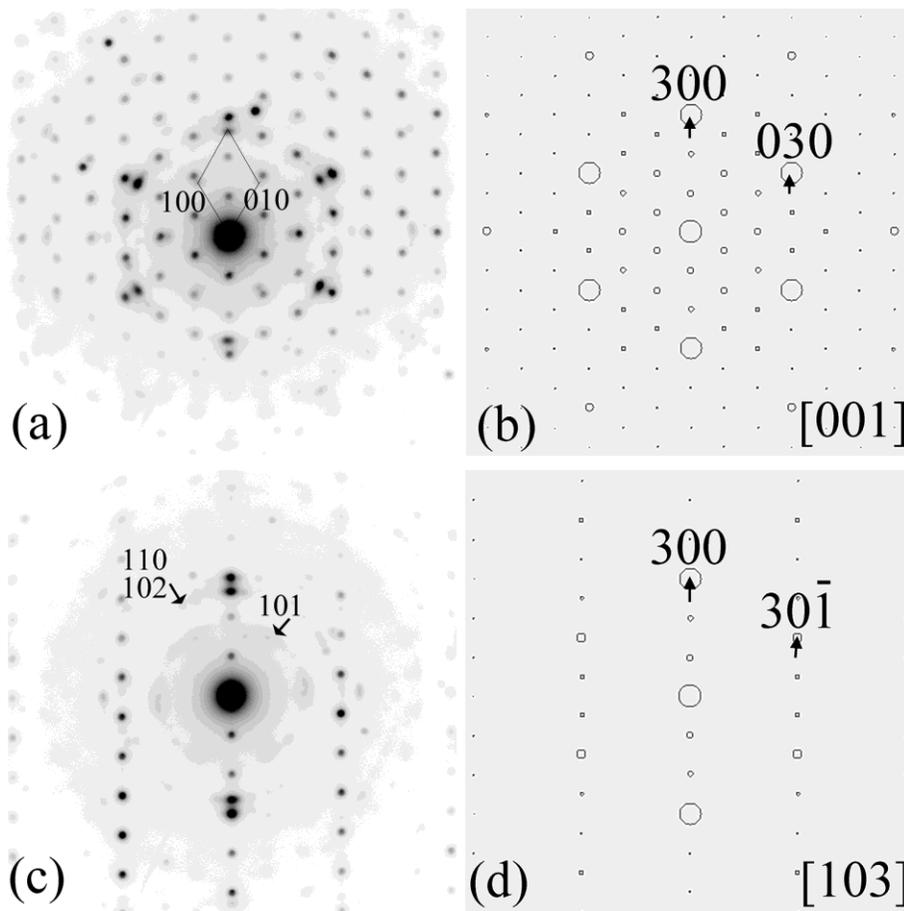


Figure 2. Experimental EDPs are selected from a tilted sample experiment (a, c) and simulated EDPs based on the structure of the γ -PtBi₂ phase (b, d). The existence of a minor phase of PtBi is marked in (a, c).

[1] X.Z. Li *et al.* *Philosophical Magazine*, **91** (2011) 3406-3415.