REFLECTION ELECTRON MICROSCOPY (REM)

REM is a combination of imaging, diffraction, and spectroscopy techniques for characterization of topography, crystal structure, and composition of surfaces of single crystals.[1] High-energy electrons are incident at glancing angles to the surface and reflected electrons are used to form an REM image, a reflection high energy electron diffraction pattern (RHEED), and a reflection high-energy loss spectrum (REELS)[2]. These techniques are applicable to metal,[3] semiconductor,[4] and ceramic[5] surfaces. Studies have been performed in ultra-high vacuum (UHV) or conventional transmission (TEM) and scanning transmission (STEM) electron microscopes.

Possible Applications

- Surface reconstructions and phase transformations
- Correlation between topographical features and reconstructions
- Directions, distribution and motion of surface steps
- Dislocations on surfaces
- Nucleation and growth of films
- Surface reactions

Specimen Requirements

Flat surfaces of single crystals (cleaved or polished) are needed. All surface cleaning treatments are the same as for other surface studies but specimens must be smaller (to fit in microscope specimen holder with 3mm diameter).

Limitations

The REM image is foreshortened in the direction of electron incidence and high resolution is achieved only in the normal direction. Images in more than one azimuth may be needed to determine all the details of the surface topography.

Suitable Microscopes

This technique is available on the following instruments:

- 2000FX TEM (JEOL)
- 2010F TEM/STEM (JEOL)

- CM200-FEG TEM/STEM (Philips)
- Tecnai F20 TEM/STEM (FEI)

References

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