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100 nm 3D Diffraction Technique for Ultra-High Spatial and Strain Resolution Combined with Versatile Analytical Probes

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This beamline is one of the phase-I projects for Taiwan Photon Source (TPS). Construction of the beamline will complete before July 2015 and commissioning for optics and end-station will follow. The beamline is dedicated to white/mono-beam Laue diffraction for structural analysis. For instance, users could obtain the 2D and 3D distribution of phases, orientation, residual strain, stress, and dislocations for materials in a complex form without destructing the samples during measurement. The estimated spatial resolution could be better than 100x100x50 nm.Furthermore, this end-station provided many complementary tools. Quadro-probe stages collect optical, electrical, surface properties of specimens; the fluorescence detector provides elemental information and the cryo-stage integrated with heater for temperature dependence experiments. Particularly, it is also the first time in synchrotron history to integrate an online real-time scanning electron microscopy (SEM) as a navigator. With spatial resolution down to 4 nm, it is able to find out the interest region with tiny structure on samples and arrange the position for different probes.This end-station can function either in vacuum or ambient environments depending on the user's demands. The station mounts an adjustment structure and settles on an active vibration cancellation optical table which minimizes the vibration level.

In summary, this beamline and end-station will provide not only 2D/3D-XRD but also XRF, XAS, XEOL/CL, SPM and SEM information for diverse research programs. The end-station is scheduled to open to user in early 2016.

Keywords

3D Laue Diffraction, XRF, XEOL, SEM, Taiwan Photon Source

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