Submicron structure imaging by Laue nanodiffraction at the Taiwan Photon Source.

Chia-Hsien Lin[1,*], Ching-Yu Chiang[1], Shang-Jui Chiu[1], Ching-Shun Ku[1,**]

[1]National Synchrotron Radiation Research Center, Taiwan Photon Source 21A
E-mail: [*]lin.ch@nsrrc.org.tw, [**]csku@nsrrc.org.tw

Abstract
Synchrotron-based Laue diffraction has been widely used to analyze the distribution of crystallinity, orientation, and defects for polycrystalline matters by the micro-/nano-focused X-ray. The beamline 21A at the Taiwan Photon Source (TPS) is dedicated for white/mono-beam Laue diffraction with spatial resolution down to 80 nm. Other than Laue diffraction, we also provided nano-beam x-ray fluorescence, x-ray excited optical luminescence (XEOL) and projection x-ray image measurement together with Laue at each scanning position. All the measurements processes are simultaneously and can be finished in few tens of milliseconds for single point. However, this very high scanning speed created massive data flow of diffraction patterns and spectra during measurement. It turns out how to handle the data flow and quick analyze the row data become an important issue during the user beamtime. For this reason, we developed a LabVIEW-based program to plot the spatial distributions of the filtered intensity, orientation, and full width of half-maximum of peaks in Laue patterns. These approaches can real-time figure out the crystallinity and grain distribution of the sample during the experiment, and help users to determine the final scanning parameters for specimen. For example, we can do a 2D cross-section scan on the nitrogen-based III-V semiconductor. The distribution of defects and stress can be defined in the Laue, and the composition can be defined in the XEOL at once.