Scanning Laue X-ray Microscopy at Taiwan Photon Source

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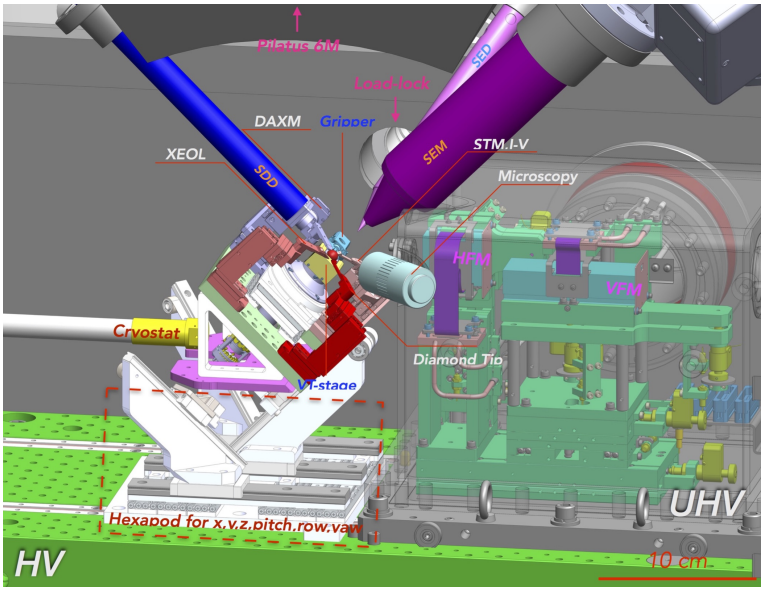
The X-ray Nanodiffraction Beamline (XND) is one of the phase-I projects for Taiwan Photon Source (TPS) in NSRRC. The end-station called "FORMOSA" (**FO**cusing x-**R**ay for **M**icr**O**-**S**tructural **A**nalysis) is dedicated to use the focusing white/mono-beam Laue diffraction for structural analysis. For instance, users could obtain the 2D and 3D distribution of crystal phases, orientations, residual stain/stress, and dislocations for materials in a complex form without annoying specimen preparation and distorting the sample during measurement. The current spatial resolution is better than 80 × 80 nm at lateral direction. Furthermore, FORMOSA also provides many complementary tools other than x-ray. The Tetra-probes could deploy several scanning probe methods such as atomic force microscopy, scanning tunneling microscopy and scanning near-field optical microscopy to collect surface, electrical, and optical properties of specimen together with structural information from Laue simultaneously; the projection x-ray detector for absorption contrast imaging; the x-ray fluorescence detector provided elemental information; the integrated hexapod scanner provided nanometer resolution in 6-degree of freedom to carry on user's own sample holder for precision measurement, and the cryogenic stage integrated with heater for temperature dependence experiments. Particularly, FORMOSA adopt with high-resolution field emission scanning electron microscopy (FESEM) inside the end-station to obtain the real-time imaging of specimen. This SEM sophisticated aligned with focusing x-ray beam at the same position on the sample surface, means users can find out the interest region on the screen and obtain the corresponding diffraction pattern instantly. All these equipment were meticulous arranged in a tiny space inside the analysis chamber of FORMOSA as shown in the figure. In summary, XND beamline and FORMOSA end-station provided not only 2D/3D-Laue Microscopy but also nano-XRF, nano-XAS, nano-XEOL/CL, SPM and SEM information for diverse research programs.

In this presentation, we will briefly introduce to you the design and commissioning results for XND and FORMOSA. In additional, the presenter also will cover some very preliminary and exciting results from users research projects cover with ultra-thin films, emergent materials and nanostructures to demonstrate the capabilities of FORMOSA.



An inside view of the FORMOSA end-station at the Taiwan Photon Source.