

TPS 20A Two Dimensional X-ray Diffraction Beamline

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Abstract

For investigating any scientific great through can be possible through structural analysis of the materials, it's very important issue to investigate the chemical and physical properties. X-ray diffraction is the major and efficient technique to obtain structure information. The semiconductor 2D thin film diffraction beamline includes two import materials analysis methods: Powder X-ray Diffraction (PXRD) and Grazing Incidence X-ray Diffraction (GIXRD). Both techniques are mature and popular in widespread scientific use, such as semiconductor science, materials science, physics, chemistry, geoscience and pharmaceutical science. In the past, people who would like to perform powder diffraction and 2D thin film diffraction experiments must apply the beamline BL01C2 and BL17A in Taiwan Light Source (TLS). Nevertheless, both beamlines have been operating for two decades, neither photon source nor equipment can satisfy users anymore. Although TPS will open a high resolution powder diffraction beamline (TPS 19A) to users in the first quarter of 2021, it still cannot meet the needs of versatile users in physics, chemistry, materials and industry applications. There is an urgent requirement to have another powder diffraction beamline. The proposed semiconductor 2D thin film diffraction beamline at Taiwan Photon Source (TPS) will be a high throughput and world leading materials science facility. The beamline intends to build at a bending magnet port 20A at the 3 GeV ring TPS. The low divergence and high brilliance of synchrotron X-ray source at TPS is appropriate for powder X-ray diffraction and grazing incidence X-ray diffraction experiments. The major functions of proposed 2D thin film and powder diffraction beamline are listed as follows:

- Grazing incidence diffraction: Diffraction data measurements for thin film, bulk and pellet samples.
- Powder diffraction studies: Structural characterization or Rietveld refinement for crystalline samples.
- High throughput studies: Quick measurements for a large quantities of powder samples.
- In-situ studies and non-ambient environments: Measuring diffraction datasets during different kinds of non-ambient environments, like heating/cooling, increasing/decreasing pressure, various gas flow and charge/discharge of battery.

Keywords – Powder diffraction, Grazing incidence diffraction.