

Current Status of High Resolution Powder Powder X-Ray Diffraction at TPS 19A

Yu-Chun Chuang (莊裕鈞)¹

¹National Synchrotron Radiation Research Center, Hsinchu, Taiwan
chuang.yc@nsrrc.org.tw

Abstract

A new dedicated high-resolution powder X-ray diffraction beamline, TPS 19A, has been designed and constructed since 2018. After two years beamline construction, the insertion device and optical components commissioning experiment has been started in early 2020. The high-resolution powder diffraction station operated at 09A was moved to 19A1 on June 23. For diverse powder diffraction applications, TPS 19A was designed to use a powerful cryogenic in-vacuum undulator, CU15, which is a PrFeB based magnet and built up by magnetic group of NSRRC. It can not only provide high flux X-rays but higher X-ray energy (12- 40 keV). Depending on distinctive scientific demands, there are two different stations were proposed. The first one experimental hutch is designed for high-resolution and ultra high-resolution powder diffraction measurements which correspond to in-situ structure dynamics and structure determination. The second experimental hutch is designed for general powder diffraction measurement and grace incidence thin film diffraction measurement using a large 2D area detector. Currently, TPS 19A has been scheduled and announced for user operation 10% in 2021 Q1 and 30 % in 2021 Q2. The details beamline parameters and available non-ambient devices were listed below.

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| <p>19A1: X-ray energy range: 12 - 20 keV Beam size: 500 μm x 500 μm High resolution PXRD measurement: MYTHEN 18K Ultra-high resolution PXRD measurement: Multi-crystal analyzers Available non-ambient sample environments: 1. LN₂ cryostream (90 K- RT) 2. Hot air gas blower (RT- 1000 °C) 3. LHe Dynaflo cryostat (10 K-150 K)</p> | <p>19A2: X-ray energy range: 12 - 40 keV Beam size: 500 μm x 500 μm (without KB focusing mirrors) 20 μm x 20 μm (with KB focusing mirrors) General resolution XRD measurement (XRD 1611) Available non-ambient sample environments: 1. LN₂ cryostream (90 K- RT) 2. Hot air gas blower (RT- 1000 °C) 3. Potentiostat (single cell: Autolab PGSTAT204; multi-cell Biologic VSP3e) 4. Gas loading system (N₂, CO₂, Ar, CO, H₂) 5. Hot temperature oven (Anton Paar HTK1200N, RT- 1200 °C)</p> |
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