



Contribution ID: 20

Type: Poster

Applications of in situ X-ray powder diffraction to geosciences.

Thursday, 20 November 2014 17:30 (1h 30m)

The powder diffraction beamline at the Australian Synchrotron exploits the unique properties of synchrotron radiation by offering tunable wavelengths (6 keV – 30 keV) to minimise sample absorption, high flux and good S/N for increased detection limits, and high resolution to minimise peak overlap. The X-ray powder diffraction beamline produces bright, high collimated X-ray beams that, when combined with the state-of-the-art Mythen II microstrip detector, are ideal for time-resolved X-ray powder diffraction experiments requiring high resolution data collection. The beamline possesses a vast arsenal of sample stages and environments that enable a multitude of in situ experiments where temperature, pressure or gaseous environment, to name a few, can be varied to observe structure change and/or formation in polycrystalline materials. Since beginning user operations in 2008, over 300 user experiments have been performed at the powder diffraction beamline.

This work demonstrates the capabilities offered by the beamline, particularly for earth sciences and energy applications, highlighting a range of unique in situ experiments that have not only produced successful scientific outcomes, but have pushed the boundaries in many cases. The options for future developments at the powder diffraction beamline are also discussed and will enable the beamline to build on its strong in situ foundations to offer more power and flexibility for its users.

Keywords or phrases (comma separated)

in situ, powder diffraction, synchrotron, beamline

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Session Classification: Welcome Function, Poster Session, Exhibition

Track Classification: Earth and Environment