MS01 - Micro & nano crystals in MX

Chairs: Dr. Helen Ginn, Dr. Thomas White

MS01-O1

VMXm: A new micro/nanofocus protein crystallography beamline at Diamond

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VMXm is a new micro/nanofocus protein crystallography beamline currently being constructed at Diamond Light Source. The beamline is designed to measure multiple rotation data sets from microcrystals down to 0.5 microns in size and minimise the sample material required for structure determination. The beamline optics will deliver a beam-size of 0.3 - 10 µm vertically, using a single custom profiled fixed focal length mirror, and 0.5 - 5 µm horizontally via a two stage demagnification scheme and a variable secondary source aperture. The beamline will operate at energies between 6 and 28 keV delivering between 10^{11} and 10^{12}ph/s to the sample (at 12 keV), depending on the optical configuration. Crystal samples will be visualised and aligned to the X-ray beam using a built-in Scanning Electron Microscope (SEM). Samples will be prepared on TEM grids, using plunge freezing techniques taken from cryo-EM. To further improve signal to noise, data will be collected from samples under vacuum. The design of the beamline will be presented, along with sample preparation techniques for submicron crystals and initial data collection results from the beamline

Keywords: Instrumentation, microcrystallography, protein crystallography

MS01-O2

Applications for serial crystallography at synchrotrons

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Serial millisecond crystallography (SMX) at synchrotrons allows typical crystallographic experiments to be performed at room-temperature. High-resolution structure determination and even native SAD phasing from small crystals becomes possible when using modern high frame-rate detectors[1]. Using a continuous room-temperature setup opens the door to new types of experiments.

Time resolved serial femtosecond crystallography at free electron lasers (FELs) can be performed with the same high viscosity injectors[2] that are used for SMX at synchrotrons[3]. The synergy between synchrotrons and FELs allows for more efficient use of precious beamtime at FELs, demonstrated in our recent LCLS beamtime in which we recorded over a million diffraction patterns of Bacteriorhodopsin.

The high frame rates of modern detectors offer a convenient way towards time resolved experiments without special beamline equipment, which may help bringing time resolved crystallography out of its niche.

Keywords: room-temperature, time-resolved, serial crystallography