Poster Presentation

MS77.P11

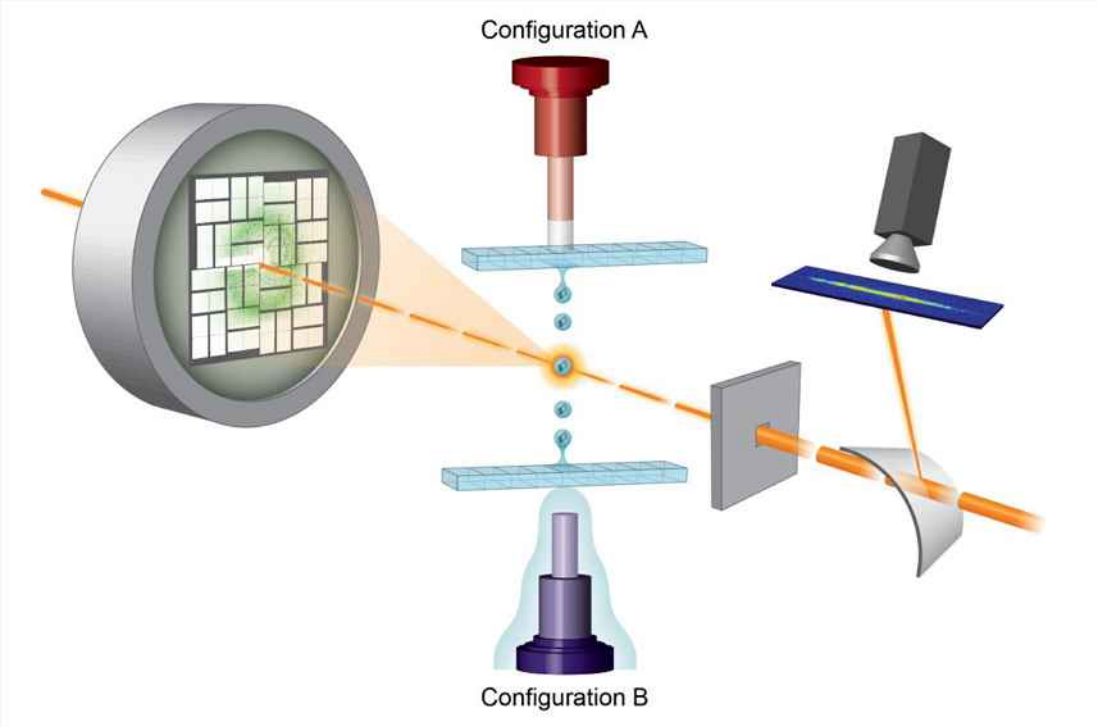
Rapid sample delivery by acoustic injection for serial protein crystallography

C. Roessler[1], M. Allaire[2], A. Orville[3], A. Soares[1]

[1]Brookhaven National Laboratory, Photon Sciences Directorate, Upton, USA, [2]Lawrence Berkeley National Laboratory, Physical Biosciences Division, Berkeley, USA, [3]Brookhaven National Laboratory, Photon Sciences Directorate and Biosciences Department, Upton, USA

Continuous irradiation of a single protein crystal alters its physical structure. This typically manifests as photoelectric chemical transformations and a loss of diffraction, which can be counterproductive to structure determination. Serial crystallography methods overcome these effects by recording partial datasets from multiple crystals, effectively spreading the dose over many crystals. As the number of crystals per dataset increases, however, new methods are needed to rapidly replenish samples in the X-ray beam. Acoustic droplet ejection (ADE) technology offers a robust and reliable method for transferring crystals. Acoustic injectors based on ADE technology use focused sound waves to deliver crystals contained within picoliter and nanoliter droplets, and can generate hundreds of droplets each second. Acoustic injectors have been tested at the National Synchrotron Light Source, where crystal-containing droplets were deposited on a goniometer-mounted conveyor belt. The conveyor belt enabled translation and rotation in the X-ray beam, permitting small wedges of data to be collected on each crystal. Crystals were also directly injected into oncoming X-ray pulses at the Linac Coherent Light Source, producing diffraction patterns from several samples under conditions of ambient temperature and pressure. Development is underway to incorporate acoustic injectors into the microfocus and automated macromolecular crystallography beamlines at the National Synchrotron Light Source II.

[1] *C. Roessler, A. Kuczewski, R. Stearns et al., Journal of Synchrotron Radiation, 2013, 20, 805-808,* ***[2]*** *C. Roessler, A. Soares, M. Allaire, A. Orville et al., manuscript in preparation.*



Keywords: acoustic droplet ejection, serial crystallography, high throughput