Oral Contributions

[MS21] Instrumentation at X-ray FELs and MX beamline for structural dynamic studies

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[MS21-01] Serial Femtosecond Crystallography of Membrane Proteins with a Lipidic Cubic Phase injector

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The progress in structure determination of Membrane Proteins and GPCRs in particular is limited by the difficulty of preparing large amounts of homogenous and stable samples and growing sufficiently large crystals for collecting high-resolution diffraction data at available synchrotron microfocus beamlines. Ultimately the achievable resolution from small, well ordered protein crystals is limited by radiation damage. The emerging method of serial femtosecond crystallography (SFX) which uses ultrashort X-ray pulses from an X-ray free electron laser to outrun radiation damage, has been shown recently to achieve atomic resolution from microcrystals in a liquid jet [1], [2].

This approach obviates the need for larger crystals and eliminates radiation damage, addressing the most significant barriers to high-resolution structure determination success with small crystals. Protein crystals grown in LCP often have limited size and are therefore ideal for SFX experiments. Unfortunately, the injector developed for SFX can only be used with low viscosity liquids [3] and a new approach is needed to generate a stream of the gel-like LCP with tens of micrometer diameter. A new LCP injector setup, allowing the collection of data from a contiguous

stream of nanocrystals embedded in LCP, has been built and tested. SFX is based on hundreds of thousands diffraction patterns, collected from a continuous stream of fully hydrated nano/microcrystals embedded in LCP or buffer liquid using hard X-ray femtosecond pulses. An overview of current injection devices with an emphasis on the LCP injector and recent results will be presented.

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