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High viscosity injector effects on the phase behaviour of lipidic cubic phase

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In serial crystallography of membrane protein crystals, high-viscosity flow injectors deliver micron-sized crystals to the x-ray beam. The protein crystals are often injected embedded in the lipidic cubic phase (LCP) media, monoolein (MO), in which they were grown. The self-assembled structure of this media is easily impacted by the performance of the injector, e.g. pressure and gas flow surround the sample injection. However, it is not yet well understood how the continuous injection impacts the phase of the monoolein and how this influences the sample stream stability. In the present work, we report on observations of the structure of MO/water and MO/buffer mixtures during continuous flow injection at atmospheric pressure and in vacuum. These observations include x-ray diffraction data taken at the Australian Synchrotron (AS) and the Linac Coherent Light Source (LCLS), as well as optical polarisation measurements. We observe the coexistence of a cubic phase and lamellar phase within the sample stream. The lattice parameters are stable over typical changes in reservoir pressure that occur during injector operation. While the degree to which the lamellar phase is formed is found to depend strongly on the co-flowing gas used to stabilise the lipid stream. We further observe sharp transitions between diamond cubic and gyroid cubic phases that do not correlate with changes in pressure applied to the reservoir. In vacuum, we observe the coexistence of the gyroid cubic, the diamond-cubic and the lamellar phase simultaneously. The existence of LCP and lamellar phase at the experimental temperature, 26 degC and pressure ranges within the reservoir is unexpected and we investigate this observation using optical imaging.

Presenter Gender

Man

Do you wish to take part in the Student Poster Slam

Condition of submission

Yes

Students Only - Are you interested in AINSE student funding

Level of Expertise

Early Career <5 Years

Pronouns

He/Him

Which facility did you use for your research

Australian Synchrotron

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