Contribution ID: **263** Type: **Talk**

In-situ macro-seeding apparatus for protein crystal growth

Monday 17 September 2018 14:55 (16 minutes)

Although X-ray crystallography allowed the determination of the three-dimensional structure of fundamental biomolecules such as proteins and nucleic acids, neutron crystallography provides a powerful complement because hydrogen atoms can be visualized directly. Due to the lower flux of neutrons compared to that of X-rays, bigger crystals (~0.5 mm3) are required. So, the improvement of the production of sufficiently large crystals is one of the requisites of neutron crystallography. For this purpose, we aim to design an in-situ macro-seeding apparatus for the growth of sufficiently large protein crystals, where the exchange of the mother liquor is allowed by means of two capillaries attached to a spacer between two flat round glass windows. This spacer defines the volume of the crystallization chamber and will be produced by a 3-D printer. In order to control the crystallization process, a Peltier element will be in thermal contact with the crystallization chamber for temperature control. The designed device allows us to use an inverted microscope to look throught the glass windows in order to monitor the crystal size during the crystallization process. The exchange of the mother liquor will allow feeding the growing crystal with fresh, highly concentrated protein in solution. Thereby, the crystal growth does not stop due to a lack of protein in solution.

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Session Classification: Micro symposium 2

Track Classification: MS2 Structural biology: Instrumentation and methods, current trends and topics