

Sample delivery methods for biology experiments at XFELs

Abstract

XFELs produce X-ray pulses, short and intense enough to image biological structures before they are destroyed by the energy of the absorbed X-rays. With the aim to image single protein molecules, the method of imaging before destruction has been successfully used for serial crystallography of nano-sized protein crystals and for single particle imaging of viruses. In this presentation I will give an overview of the different sample handling methods, that are used or under consideration for biological experiments at XFEL sources. For nano-crystallography, liquid jets are used to deliver the samples in liquid solutions to the X-rays. Single particles – such as viruses – are more commonly prepared as aerosols and injected into the experimental chamber by aerodynamic lenses. Based on native mass-spectrometry, a new sample delivery method for charged proteins is under consideration at the European XFEL. All these methods can be used not only for biological samples but for a wide range of samples for scattering and spectroscopy experiments. I will give an overview of the sample delivery methods for the six scientific instruments of the European XFEL.