FIP (French Beamline)on BM30: Investigation of Protein Structures

FIP is a French CRG beamline under construction at the BM30 front-end. It will be dedicated exclusively to biological macromolecular crystallography. FIP will replace the biocrystallography station at the CRG beamline D2AM, where it used only half of the available beam time, sharing the space with materials science experiments.

The move of biocrystallography from D2AM to FIP has started in March 1998. However FIP will come into full operation only by the end of 1998. What can be foreseen at present is the following: in September 1998, the beamline will be ready with the same equipment and similar beam characteristics as it was on D2AM, and we will start to invite selected external users for data collection. But with respect to D2AM, two new developments are prepared: 1) using cryo-cooling on the first monochromator crystal and 2) using piezoelectric actuators for bending a long U-shaped crystal. The first improvement will allow the extension of the range of accessible x-ray photon energy up to 25 keV, and the second one should make the focusing of the beam faster and more efficient by sagittal bending. New detectors will also be installed on the beamline. Next September we will start installing the cryo-cooling of crystal 1 of the monochromator and probably an image plate detection system. Later in the year, a new CCD detector will be installed replacing the XRII-CCD used on the D2AM station since 1995. As another improvement with respect to D2AM, the beamline will have its own cold room as part of the small crystal preparation laboratory located on the beamline itself.

The gain in beam time for data collection will contribute to improve the quality of the collected data in two aspects, first more time for data collection, of course, i.e. better statistics, but secondly more time for careful data collection preparation. It will also allow, hopefully, the development of two time-consuming new applications, namely 1) kinetic studies of biological reactions produced in the crystals, by collecting monochromatic data after flash-cooling of the crystals in intermediate states of reaction, and 2) the fine study of the x-ray diffraction in proteins with heavy atoms near the absorption edge, which requires collecting data at a high number of wavelengths on the absorption edge.

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IF (French Beamline) on BM32: Interfaces

The word «interface» has a very wide meaning, and interfaces may be found in nearly everything, from materials to living beings. Hence a large number of researchers from very different scientific fields have been interested in the project from the beginning, which is illustrated by the large diversity of experiments that have been performed concerning new materials, soft condensed matter, environmental science or biology.

The beamline has been focused on two complementary techniques: Glancing x-ray diffraction, which probes the long range order, and x-ray absorption spectroscopy (XAS) which probes the short-range order. This resulted in three experimental stations, one equipped with a multi-purpose goniometer (GM), one dedicated to x-ray absorption spectroscopy (XAS) experiments, and one devoted to surface x-ray diffraction in ultra-high vacuum called SUV. The two first instruments were commissioned in 1994, and the last one in 1996. The details of the beamline and experimental stations can be found in the ESRF Beamline Handbook. Because of its very versatile design, the GM instrument is a user-oriented facility that fits the needs of a wide community. The research on the «GM» diffractometer has been balanced between studies of « soft » and « hard » condensed matter.

In the field of soft-condensed matter, many experiments have been devoted to the study of monolayers such as amphiphilic films on liquids [1] and of free-standing liquid crystal films [2], intended to test theories on the elastic properties of membranes with full calculation of the fluctuation spectrum, from macroscopic to molecular sizes, including various kinds of interactions. Liquid crystal films supported by solid substrates like MoS_2 have also been investigated to determine the structural evolution with temperature and correlate it to the observations of atomic force microscopy, thus providing insight on the mechanisms of inter-molecular and substrate/molecule interactions. These studies open up large perspectives on the influence of dimensionality and substrate adhesion on order phase transitions in liquid-crystals. Other experiments have been devoted to the 2D transitions of alcohol layers adsorbed at the air/water interface, with a particular attention to the influence of chirality, opening the