As an example we show a time series of detector scans in Figure 4. Each scan was taken after three minutes delay time with a counting time of one second per point. In summary we presented experiments using coherent x-ray scattering in a reflection geometry to investigate thin polymer films. In the blend film system the scattering in the demanded *q*-range is enhanced by surface labelling, whereas in the diblock copolymer film system the roughness correlation of the multilayer interfaces provides the high intensity. Therefore both samples are well suited for experiments using x-ray photon correlation spectroscopy, because they deliver a good signal-to-noise ratio in the observed speckle patterns. Thus they are good candidates for further dynamic measurements. This will enable the determination of the time correlation function of the surface and interface dynamics and will open up the door for examinations of capillary waves, surface diffusion processes and membrane dynamics.

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First Experiments on Troïka II

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The Troïka II beamline (ID10B) started user operation on schedule in April 1998. This second branch of the Troïka beamlines is again an open beamline with a flexible diffractometer which aims at providing additional beam time for demands in the soft-condensed matter community. Special emphasis to surface and interface studies using grazing-incidence diffraction and x-ray reflectivity is given.

Although Troïka II uses the same undulator source as Troïka I (ID10A), both stations can work independently in parallel. A thin diamond (111) crystal acts as monochromator and beam splitter (see Figure 1), a technique which has been pioneered at the Troïka beamline. A second (111) diamond crystal deflects the monochromatic beam at a constant offset from the white beam path. The energy range of this double-crystal monochromator is 8 to 12 keV. As a further optical element, a plane double mirror for harmonic rejection is in preparation. Presently, harmonic rejection is achieved with two small mirrors in the experimental hutch.

The Troïka II eight-circle diffractometer with an additional beam deflector can operate both in horizontal and vertical scattering geometry. In horizontal geometry heavy and bulky sample environments can be handled. In combination with the deflector, a device that employs either a mirror or a Bragg crystal to deflect the beam out of the horizontal plane, the horizontal geometry

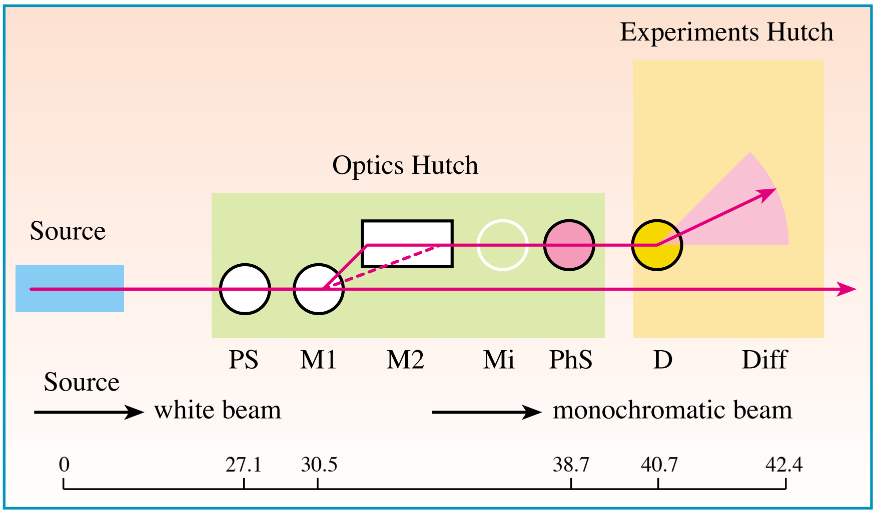

Fig. 1: Troïka II layout: PS primary slits; M1, M2 diamond double-crystal monochromator; Mi planned double mirrors; PhS photon shutter, D deflector, Diff: eight-circle diffractometer.

is particularly useful for the investigation of liquid surfaces and self-organization of amphiphilic molecules at the air-water interface. For these studies a large linear detector can be used in combination with Soller slits or an analyzer stage. In collaboration with a group at Saclay a large multi-purpose Langmuir trough is in development. Other possible sample environments could involve cryostats, furnaces, or small vacuum chambers to be supplied by the users.

The vertical scattering geometry is used for small samples and sample environments to study surfaces or thin films in air or under inert gas. In this geometry the largest reciprocal space access is provided. It will be particularly important for the in-house research activities which will focus on the investigation of thin organic films on solid substrates. Various detector options are available, such as a scintillation detector with motorized slits and a small linear detector which can be combined with an analyzer stage.

The spectrum of research activities at Troïka II can be best exemplified by the first six user experiments. In the very first experiment, Daillant *et al* investigated the diffuse scattering from the surface of water and various other liquids. The goal of the experiment was to determine whether there are higher order corrections to the surface tension. In the experiment the incident x-ray beam impinges on the liquid surface below the critical angle and creates an evanescent wave parallel to the liquid surface with a penetration depth of about 50 to 100 Å. The evanescent wave is scattered by capillary waves giving rise to diffuse scattering up to 50° scattering angle in-plane which is integrated perpendicular to the liquid surface by a large linear detector. Important for this experiment is a very clean, well defined beam without high-energy contamination. The latter was achieved by a low-pass filter consisting of two small platinum coated mirrors in deflector and flight path which were set close to the critical angle.

In the second experiment, Möhwald *et al* characterized selected phases in the phase diagram of the fatty acids $C_nH_{2n+1}COOH$ with n = 18, 20, 22, and 24. The phase diagram of these amphiphilic molecules is well understood theoretically and certain predictions were to be tested in the experiment. In particular, the variation of the lineshapes in the L_2 to L'_2 phase transition was to be investigated where the direction of the tilt of the molecular axis changes from the nearest-neighbor direction to next-nearest neighbor. The data are presently being analyzed.

The remaining four experiments use the vertical scattering geometry. Lacaze *et al* tried to determine the 4 x 16 phase of the liquid crystal 8CB absorbed on MoS_2 which they found previously with STM and first grazing-incidence diffraction experiments. This experiment is very difficult due to the large mosaicity of about 0.5° of the substrate and the low Z of the liquid crystal film. The experiment addresses the problem of anchoring a liquid crystal on an atomically well-defined interface. In the following experiment by Lucas *et al* the electrochemical absorption of CO on Pt(111) and Pt(100) surfaces will be studied. Again the problem will be to see a low-Z monolayer on a high-Z substrate. Finally, the last two experiments by Abstreiter *et al* and Metzger *et al* will investigate the self-organization of quantum dot arrays in strain-modulated superlattices. In these last two experiments a high-resolution set-up with analyzer and linear detector will be used.

The Troïka II beamline addresses the needs of both the soft and hard-condensed matter community by making more beam time available for interface and thin films studies. A variety of scattering geometries and detectors options is available. For more detailed information, please contact D. M. Smilgies (tel +33 (0) 4 76 88 27 31 – email: smilgies@esrf.fr). ■