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V1: Membrane Diffractometer at BER II

Helmholtz-Zentrum Berlin für Materialien und Energie [*]

Instrument Scientist:
- Dr. Thomas Hauß, Helmholtz-Zentrum Berlin für Materialien und Energie, phone: +49 30 8062-42071, email: hauss@helmholtz-berlin.de

Abstract: The V1 Membrane Diffractometer is dedicated for biological samples or other samples with large unit cells (5 -10 nm in cell length). Its main application is the investigation of biological and synthetic membranes. For these studies, dedicated sample environment is available, including the new BerILL humidity chamber with a continuous range in relative humidity (RH) from 10 % RH to 100% RH.

1 Introduction

The design of the instrument is dedicated for biological samples or other samples with large unit cells (5 -10 nm in cell length). The vertically focusing graphite monochromator provides adjustable wavelengths between 0.4 nm and 0.6 The V1 Membrane Diffractometer is making use of the full cross section of the neutron guide (3 cm wide, 12.5 cm high). A Be-filter at liquid nitrogen temperature is used to suppress second order wavelengths below 0.39 nm. If less stringent collimation conditions allow, high flux at short monochromator-sample distances (approx. 80 cm) are made possible by a compact construction of shieldings. Sample and detector supports are movable on aircushions. The maximum Q value in all configurations with Be-Filter is limited to 22 nm^{-1}.

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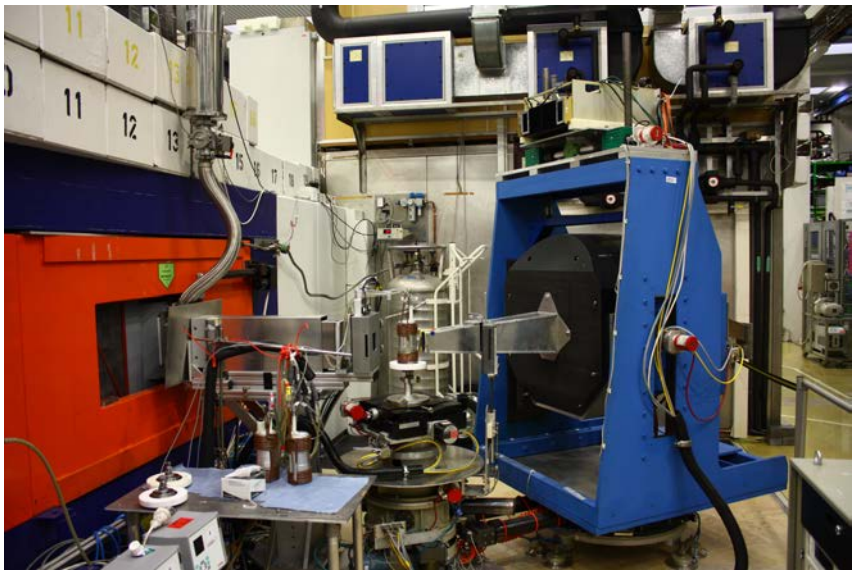

Figure 1: View of the Membrane Diffractometer V1; left: monochromator shielding; middle: sample position on omega-table; right: 2-dimensional detector with lift.

2 Instrument application

Typical applications are:

- Biological membranes
- Biological single crystals
- partly oriented systems (polymers, microemulsions, micelles...)
- magnetic satellite reflections

3 Instrument layout

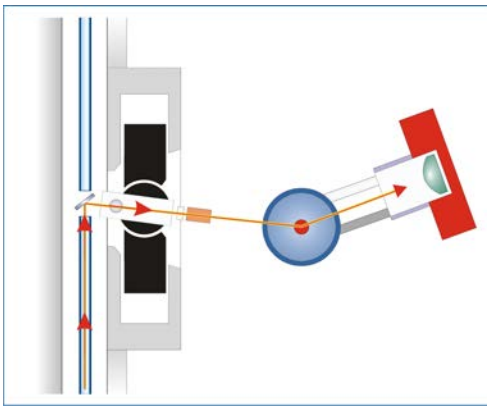

Figure 2: Schematic view of V1.

4 Technical Data

Beam tube	NL 1A
Collimation	α_0 = 1° at 0.45 nm (resulting from the ^{58}Ni-neutron guide) α_1: defined by two slit systems
Monochromator	PG (002), vertically focusing
Take off angle of monochromator	$2\Theta_M$ = 60°-120° (not alterable during experiment)
Wave length	λ = 0.4 - 0.6 nm
Flux at sample position	1 x 10^7 n/(s cm^2) (standard collimation)
Range of scattering angles	-10° < 2Θ > 120°
Detector	^{3}He, 19 x 19 cm pixel size 1.5 x 1.5 mm^2 height and inclination adjustable
Polarized neutrons	No
Sample environment	Special sample containers with humidity and temperature control
Software	CARESS with special features for area detector and powder diffraction data evaluation
Monochromator/sample distance	0.8 m - 1.5 m (extendable)
Sample-to-detector distance	0.8 m - 2.0 m

Table 1: Technical parameters of V1.

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