Development and implementation of VUV-CD and LD measurement beamline using a polarizing undulator at TERAS BL-5.

Masahito TANAKA[1], Kazutoshi YAGI-WATANABE[1], Toru YAMADA[1], Fusae KANEKO[2], Kazumichi NAKAGAWA[2]
[1]AIST, [2]Kobe Univ.,

We have developed and improved the beamline for vacuum ultraviolet circular dichroism (VUV-CD) and linear dichroism (VUV-LD) measurement in the storage ring TERAS BL-5 at AIST, Tsukuba, Japan. This beamline equipped with the four-period Onuki-type crossed undulator [1] as an insertion device. Since natural VUV-CD is known to be weak signal, at most 1 % of photo-absorption, high-sensitive AC modulation spectroscopic method is required for accurate CD measurement. This undulator can modulate the circular and linear polarization relatively high frequencies, up to 5 Hz, sufficient for AC modulation spectroscopy.

Figure 1 shows the optical arrangement of BL-5 and a schematic diagram of the VUV-CD and LD simultaneous measurement system. The Seya-Namioka type VUV monochrometer is equipped with several holographic concave gratings which cover the wavelength region from 40 to 250 nm. The wavelength resolution of monochrometer, $\lambda/\Delta\lambda$, was estimated to be greater than 1000. Since polarization of undulator radiation was disturbed by the optics, Stokes vectors of incident light are determined in order to obtain the accurate CD and LD spectra [2]. Details of the AC-modulated VUV-CD and LD spectroscopic method have been described elsewhere [3-5].

Figure 2 shows the VUV-CD spectra of L-, D- and DL-Leu films and VUV-LD of D-Leu films measured with our system and conventional CD and LD spectrometer. The obtained spectra show good consistency with spectra measured by conventional methods at wavelength down to 185 nm. The VUV-CD spectra of L- and D-Leu films showed an obvious symmetry and the spectra of DL-Ala showed no spectral feature in the wavelength region from 160 to 210 nm. Moreover, we have already succeeded in measuring the VUV-CD spectra at wavelength down to 120nm [3].

[REFERENCES]

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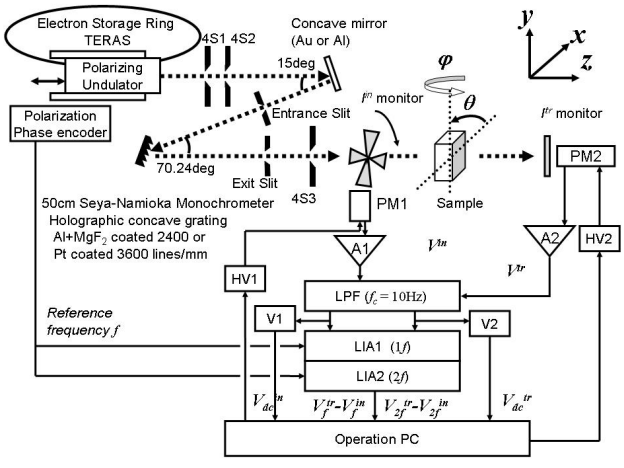

Figure 1.
Optical arrangement of TERAS BL-5 and schematic diagram of the VUV-CD and LD measurement system: S1-3, 4-blades slits; PMl, PM2, photomultipliers; HV1, HV2, electric high voltage suppliers; A1, A2, I/V amplifiers; LPF, electrical low-frequency pass filter (fc = 10 Hz); V1, V2, digital voltage meters (sampling rate = 100 Hz);LIA1, LIA2, digital lock-in amplifiers operated in lf and 2f mode, respectively.

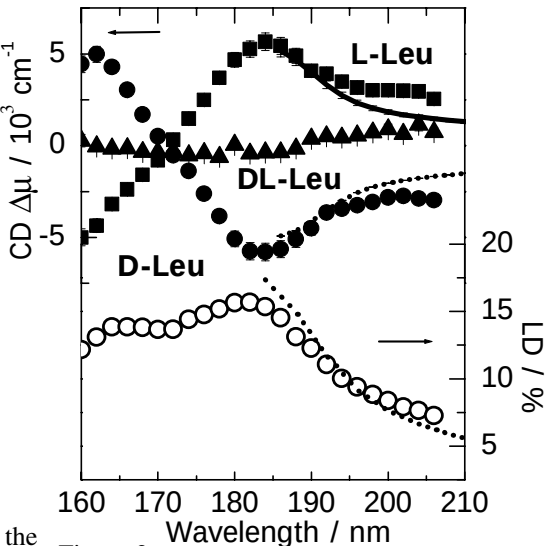

Figure 2.
VUV-CD spectra (up) of L-Leu (closed squares), D-Leu (closed circles) and DL-Leu (closed triangles) films and VUV-LD (down) of D-Leu (open circles). CD and LD spectra with conventional spectrometer are also shown as lines.