## Universal X-ray Ellipsometer and X-ray Depolarizer

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We have developed an universal X-ray ellipsometer which consists of an X-ray polarizer, aberration-free multiple phase retarders[1] and an analyzer. It enables us to create an X-ray beam having a high degree (P > 0.98) of linear, circular or other polarization state in X-ray region. It also enables us to analyze precisely the polarization states of the beam transmitted or diffracted by the specimen. The available X-ray energy range is 6-18 keV. With this X-ray ellipsometer, we have successfully measured polarization-dependent DAFS (diffraction anomalous fine structure) spectra of an antiferromagnetic CoO single crystal at the cobalt K-absorption edge. The 111 reflection includes scattering from atoms having both up- and down-spin, while the 511 reflection includes scattering from atoms having either up- or down-spin. The difference in DAFS spectra for right- and left- circular polarization was observed in the 511 reflection (~5%), but not in the 111 reflection.

In addition, we propose an idea to generate non-polarized X-rays from polarized synchrotron X-ray radiation by using a transmission-type X-ray phase retarder as a depolarizer. The X-ray depolarizer is useful for experiments such as MAD where a specific polarization state is a nuisance for data analysis. The principle and performance of the depolarizer will be reported.

[1] Okitsu K., Ueji Y., Sato K., Amemiya Y., *Acta Cryst.*, 2002, **A58**, 146. Keywords: polarization optical technique, DAFS, MAD