Broadband polarization multilayers for 6.7~20 nm wavelength range

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For polarization-sensitive studies, such as circular dichroism spectroscopy, and spin-polarized photoelectron spectroscopy, accurate measurement of the polarization state of the radiation is necessary, which requires polarization optical elements, such as analyzer and phase retarder. In extreme ultraviolet region, periodic multilayers are commonly used in polarization study when they work at the quasi-Brewster angle. However, because of the narrow reflection band of a periodic multilayer, the multilayers must be translated or rotated to perform broadband polarization analysis. To simplify experimental setup in EUV broadband polarization measurement, the concept of broadband polarized elements using non-periodic multilayers has been proposed. A series of broadband non-periodic polarized components to cover a wide wavelength range from 6.7nm to 20nm using different multilayer material combination, such as Mo/Si (12.5-20 nm), Mo/Y (8-12 nm), Mo/B_4C (6.75-7.35 nm), La/ B_4C (6.72-8.32 nm) have been successfully realized in our laboratory. All the multilayers were deposited by using magnetron sputtering. Figure 1 shows the design results which gave a flat reflectivity in a definite wavelength range. All the multilayers were designed at their Brewster angle near 45º. The polarization performance of them was evaluated using the high precision 8-axes ultra-high vacuum soft X-ray polarimeter on the beamline UE56/1-PGM-1 at BESSY II. Figure 2 shows the measured results.

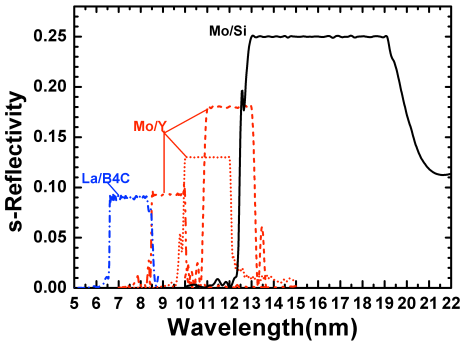

Fig. 1. Design results of non-periodic multilayer with broad reflection band

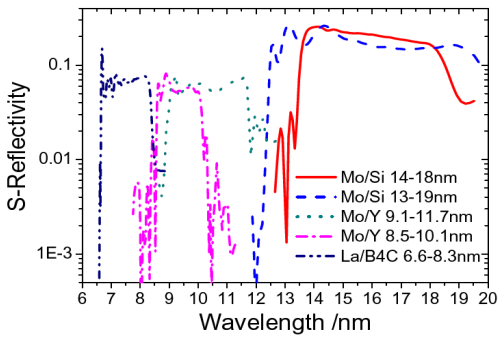

Fig. 2. Measured results of non-periodic multilayer analyzers

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