Optical Components for Polarization Analysis of Soft X-ray Radiation

H. Grimmer, O. Zaharko (PSI, Villigen)

H.-Ch. Mertins, F. Schäfers (BESSY, Berlin)

Periodic multilayer mirrors consisting of alternating layers of Co/C, Ni/Ti or Ni/V have been produced by sputter deposition. The period has been chosen such that the first Bragg peak appears at the Brewster angle ($\Theta \approx 45°$) if the energy of the radiation is close to the K edge of C or the L_3 edges of Ti or V, respectively. The reflectances R_s and R_p of these mirrors in s- and p-polarization geometry have been measured at beamline PM4 of BESSY I using the BESSY polarimeter [1] and a 10 μm wide exit slit to get good energy resolution ($E/\Delta E \geq 300$). The measured maximum values close to the relevant edges were $R_s = 18.3\%$ and $R_s/R_p = 13.4$ for Co/C, $R_s = 6.0\%$ and $R_s/R_p = 5.6$ for Ni/Ti, $R_s = 8.5\ \%$ and $R_s/R_p = 5.3$ for Ni/V. The beam available at PM4 contains a considerable amount of circular polarization, which has been determined at the K edge of carbon and can be estimated for the L edges of Ti and V. For a purely linearly polarized beam with the same value of $E/\Delta E$ the corrected values are $R_s = 21.6\%$ and $R_s/R_p = 37$ for our Co/C multilayer; $R_s = 6.8\%$ and $R_s/R_p > 8$ for Ni/Ti; $R_p = 9.5\%$ and $R_s/R_p > 7.5$ for Ni/V. These figures show that the three multilayer mirrors are suitable to be used as analysers for polarization analysis close to the respective absorption edges.

[1] F. Schäfers et al., *Applied Optics,* **38** (1999) 4074-4088.