

Second-harmonic induction by the magnetization of Fe-Au alloy films and Fe/Au multilayered films

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The magneto-optical properties of Fe/Au multilayered films (MLF) have been intensively investigated during the recent decades. However, the origin of a prominent structure observed in the UV range of magneto-optical Kerr-effect (MOKE) spectra has not been fully understood yet. Magnetically-induced second-harmonic generation (MSHG) is a very sensitive tool for investigating the magnetic properties of surfaces and interfaces of magnetic films. Therefore, by combining MSHG with MOKE, which is used in studying bulk magnetism, a systematic understanding of the magnetic properties of thin films and MLF can be achieved. In this work, the magnetic properties of Fe-Au alloy and Fe/Au MLF were investigated by MOKE and MSHG. $(t_{\text{Au}}/3.0 \text{ nm Fe})_{20}$ MLF (where $t_{\text{Au}} = 1, 2.0$ and 3.0 nm) and $\text{Fe}_x\text{Au}_{1-x}$ ($0 < x < 1$) alloy films were prepared by rf-sputtering. The structures and the magnetic hysteresis loops of Au/Fe MLF and Au-Fe alloy films were obtained by using x-ray diffraction and vibrating-sample magnetometry (VSM), respectively. The MOKE was understood in the equatorial mode and the MSHG measurements were performed in the longitudinal mode. It was found that the MOKE signals from some of the alloy films and the MLF were greater in the UV range than that from the pure Fe. The origin of these peculiar magneto-optical properties is analyzed in connection with the MSHG and the VSM results.