

Linear and nonlinear spin-photonic study on Fe/Au multilayered films and Fe-Au alloy films

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The magnetic and spin-photonic (SP) properties of Fe/Au multilayered films (MLFs) and Fe-Au alloy films were comparatively studied to elucidate the peculiar SP properties of Fe/Au MLF. (3.0 nm Fe/ t_{Au})₂₀ MLF, where $t_{\text{Au}} = 1.0, 2.0, 2.5$ and 3.0 nm, and Fe_xAu_{1-x} ($0 < x < 1$) alloy films of about 100 - 150 nm in thickness were prepared by rf-sputtering onto glass substrates at room temperature. The structures of these films were studied by x-ray diffraction. The magnetic properties were investigated by using a vibrating-sample magnetometer. The SP properties of Fe-Au alloys and Fe/Au MLF were measured by using magneto-optical Kerr effect (MOKE) and magnetically induced second-harmonic generation (MSHG). The MSHG is a very sensitive tool in investigating the magnetic properties of surfaces and interfaces of magnetic thin films and magnetic/nonmagnetic heterostructures. The MOKE and the MSHG measurements were performed in the longitudinal mode. To understand the skin-depth effect of MOKE, the angular dependence of MOKE signal was obtained and compared with that of simulated one. By combining the results obtained from the MSHG and the MOKE measurements, the magnetic properties of alloy films and MLFs can be further understood.