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Plasmon Polariton Excitation and Enhancement of the Magneto-optical Activity

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Light can be localized and manipulated in metallic and metallo- dielectric nanoparticle arrays and/or thin film structures via Plasmon Polariton excitation. This phenomenon is very sensitive to slight changes in the dielectric constant at the surface and it has been successfully applied to bio-sensing. [1] During the Plasmon excitation the associated electric field is strongly enhanced near the dielectric-metal interface, [2] and this can also enhance magneto-optical activity in magnetic layers and/or nanomagnets. We have studied this effect in Au/Co/Au tri-layered structures, and we measured the reflectivity (R) under an alternating magnetic field and found that the surface Plasmon excitation itself depends on the applied magnetic field because of the magnetic field dependence of its wave vector. We have achieved remarkably high $\Delta R/R$ modulated performance, in excess of 150% at moderate magnetic fields externally applied, when excited in Kretschmann configuration [3].

[1]. Jung, L.S. et al, *Sensors and Actuators B* **54**, 137-144 (1999); Lu, H.B., et al., *Sensors and Actuators B-Chemical* **74**(1-3), 91-99 (2001); Jung, L. S. et al, *Langmuir* **14**, 5636-5648 (1998).

[2]. C. Hermann, *Phys. Rev. B* **63**, 235422 (2001)

[3]. E. Kretschmann, *Z.Phys.* **241**, 313, (1971).