

Nanoplasmonics and surface enhanced spectroscopy

Metal-multilayer-dielectric structure for enhancement of evanescent waves

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We consider structure consisting of a thin metal layer at the surface plasmon resonance (SPR) condition and multilayer dielectric structure which provides enhancement of evanescent waves. Various configurations of sensitive optical sensors based on SPR are widely investigated. Highly sensitive evanescent waves are very attractive for studying optical characteristics of samples with subwavelength resolution. It was shown in [1] a multilayer dielectric structure can be designed to enhance the intensity of evanescent wave.

We propose further development of this approach by using a combination of thin metal layer and multilayer dielectric structure which consists of a series of alternating high- and low-index of refraction quarter-wave layers. The structure parameters are chosen to optimize the angular distribution of intensity for *s*- and *p*-polarizations of the incident laser beam.

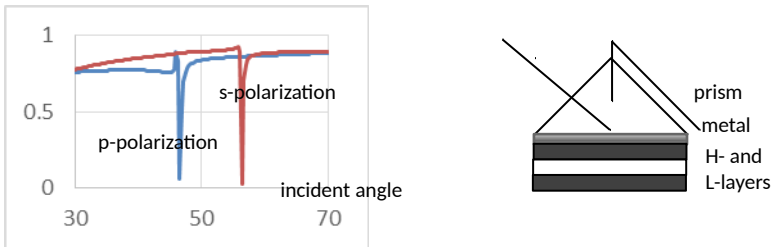


Fig. 1.

The structure configuration and the angular spectrum of reflected radiation are shown on Fig. 1. The numerical modeling was provided for the structure consisting of silver layer and series of TiO_2 and SiO_2 layers. It is denote that proposed structure allows obtaining the intensity dip at *s*- and *p*-polarization at the same or different angles. The possibility of control the dispersion curve of such structure by using two metal layer half of optimal thickness is discussed. This structure should be attractive for various applications such as SPR sensors with possibility to observe both light polarizations.

1. Renée C. Nesnidal and Thad G. Walker. Multilayer dielectric structure for

enhancement of evanescent waves. // 2226 Applied Optics, Vol. **35**, No. 13, 1 May 1996.