SURFACE PLASMON RESONANCE FOR AIR USED FOR CHARACTERIZATION OF A METALLIC LAYER

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A spectral method based on surface plasmon resonance (SPR) can be used to measure small changes in the refractive index of a liquid analyte [1, 2]. As an example, the SPR phenomenon in the Kretschmann configuration comprising an SF10 glass prism, gold coated SF10 slide and an analyte can be analyzed theoretically and experimentally in the spectral domain using both the ratio of the reflectances of *p*- and *s*-polarized waves and their phase difference [2]. Using the dispersion characteristics of a metallic layer according to the known model, the analysis for one angle of incidence can give the results that agree well with the experimental data [2]. However, if the different angles of incidence are considered, the agreement fails because the SPR response is very sensitive to the dispersion characteristics of a metallic layer. In this paper, a simple technique is proposed to obtain the dispersion of the complex permittivity of a metallic layer. To minimize the effect of an analyte, the SPR phenomenon is considered for air when a desirable angle of incidence is adjusted. Next, we measure parameters of the ratio of the reflectances of *p*- and *s*-polarized waves at different angles of incidence, that is, the minimum in the reflectance ratio and the resonance wavelength, to obtain the real and imaginary parts of the complex permittivity. The dispersion of the metallic layer thus retrieved is compared with the dispersion models available. Moreover, the applicability of the new approach is demonstrated for one analyte, water, and the ratio of the reflectances of *p*- and *s*-polarized waves and their phase difference for different angles of incidence are specified.

[1] P. Hlubina, M. Duliakova, M. Kadulova, D. Ciprian, *Opt. Commun*., **354** (2015), 240-245.
[2] P. Hlubina, D. Ciprian, *Plasmonics*, **12** (2017), 1070-1078.