SENSING OF LIQUID ANALYTES USING SURFACE PLASMON RESONANCE AT DIFFERENT ANGLES OF INCIDENCE

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In this paper, a new method of sensing small refractive index changes of a liquid analyte using the effect of surface plasmon resonance (SPR) at different angles of incidence is presented. The method is based on detection of the phase shift induced by SPR in the Kretschmann configuration with an SPR structure comprising an SF10 glass prism, a gold coated SF10 slide with chromium adhesion layer, and an analyte (aqueous solutions of ethanol). First, the theoretical modelling of the phase shift at different angles of incidence induced by SPR is performed using the material dispersion characteristics, that is, the refractive index dispersion of the SF10 glass (Sellmeier formula), the complex refractive index dispersion of chromium and gold (Drude-Lorentz formula), and the refractive index dispersion of the analyte (Lorentz–Lorenz formula) [1]. The phase shift at different angles of incidence is evaluated at a specific wavelength as a function of the analyte parameter, and the sensitivity is determined. Second, the theoretical modeling is accompanied by an experiment utilizing a polarimetry setup [1, 2] to detect the spectral phase shift induced by SPR. The polarimetry setup with an SF10 glass prism, immersion oil and a gold coated SF10 slide is employed to measure the spectral phase shift for aqueous solutions of ethanol. In addition, the phase shift is measured at a specific wavelength as a function of the analyte parameter, and the sensitivity is determined for different angles of incidence.

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