

# Nanooptics and photonics

## Influence of temperature on the surface-plasmon resonance sensor elements

**I. Yaremchuk<sup>1</sup>, V. Fitio<sup>1</sup>, V. Andrela<sup>1</sup>, Ya. Bobitski<sup>1,2</sup>**

*<sup>1</sup> Department of Photonics, Lviv Polytechnic National University,  
S. Bandery str. 12, Lviv, 71013, Ukraine.  
E-mail: iryna.y.yaremchuk@lpnu.ua*

*<sup>2</sup> Faculty of Mathematics and Natural Science, University of Rzeszów,  
Rejtan's str. 16b, Rzeszów-35-959, Poland.*

Characteristics and sensitivity of surface plasmon polariton or resonance sensors are crucially affected by temperature fluctuations. Besides temperature-induced opto-mechanical displacements, resonance conditions and associated output quantities vary, due to thermo-physical properties of optical components, like prism, semi-transparent metal-film and aqueous solution [1].

In this context, the influence of temperature on the characteristics of a sensor based on surface-plasmon resonance has been theoretically analyzed. The theoretical model for temperature dependence includes the thermo-optic effect and phonon–electron scattering along with electron–electron scattering in the metal layer. The effect of temperature on the surface-plasmon resonance and the sensitivity of the sensor with two different metals (silver and gold) have been compared. Temperature dependences of the resonance position and the sensitivity of the surface-plasmon resonance sensor were calculated.

This detailed analysis of temperature dependent surface-plasmon resonance and sensitivity leads to achieving the best possible performance from the sensor against the temperature variation.

**1. Moreira, C. S., Lima, A. M. N., Neff, H., Thirstrup, C.** Temperature-dependent sensitivity of surface plasmon resonance sensors at the gold–water interface //Sensors and Actuators B: Chemical.-2008.-**134**, N 2.-P. 854-862.