Refractive Index Measurement of Aqueous Mixtures Using Surface Plasmon-Enhanced Ellipsometry

Michal Hausner[1], Juraj Chlpík[2, a)], Jaroslav Kováč[1], Roman Michelko[2], Pavol Valko[2], and Július Cirák[2]

[1]*Institute of Electronics and Photonics, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Ilkovičova 3, SK-841 04, Bratislava, Slovak Republic.*
[2]*Institute of Nuclear and Physical Engineering, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Ilkovičova 3, SK-841 04, Bratislava, Slovak Republic*

[a)]*Corresponding author: Juraj.chlpik@stuba.sk*

Abstract. Surface plasmon-enhanced ellipsometry, also known as total internal reflection ellipsometry (TIRE), is commonly used to detect small changes at interfaces between a metallic surface and a liquid phase. It can also be applied to determine the refractive index of the fluid under study. Unlike standard refractometry, which typically operates at a single wavelength, TIRE allows measurements at multiple wavelengths. In this work, we present measurements of the refractive index of aqueous mixtures, primarily ethanol and isopropyl alcohol. These mixtures serve as model analytes for testing a developing SPR-based liquid sensor utilizing a planar waveguide with a gold layer. TIRE not only enables the measurement of the refractive index but also provides a direct comparison of SPR excitation conditions relevant for future implementation in the intended sensor.

ACKNOWLEDGMENTS

This work was financially supported by the grant of Cultural and Educational Grant Agency (KEGA) of The Ministry of Education, Research, Development and Youth of the Slovak Republic No. 006STU-4/2025, and by the grant of the Slovak Research and Development Agency, project No. APVV-20-0437.