

Title: Complex diffractive structures for surface plasmon resonance sensors

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Abstract: Nowadays, biosensors based on surface plasmon resonance (SPR) present one of the most advanced label-free optical biosensor technologies. These sensors are based on the monitoring of refractive index changes in the vicinity of a plasmonic metal and enable both rapid and sensitive detection of various biological or chemical agents as well as the analysis of biomolecular interactions in real time. This doctoral thesis presents the results of research of advanced diffractive structures having benefits for SPR biosensor technology. In addition to a theoretical analysis, this work consists of the fabrication and characterization of selected diffractive structures, and furthermore, the development of novel types of SPR biosensors based on these structures. In particular, the results presented in this thesis include the development of a novel method of fabrication of periodic plasmonic arrays based on multiple-beam interference lithography, the development of compact high-resolution diffraction grating-based SPR devices, and development of advanced SPR biosensors based on both long-range and short-range surface plasmons.

Keywords: diffractive structures, surface plasmon, biosensor, optical sensors, SPR