Formation of periodic plasmonic structures on a thin gold layer sputtered on different surfaces

Rodrigas Liudvinavičius[1*], Kipras Čepaitis[1], Kernius Vilkevičius[1], and Evaldas Stankevičius[1]

[1] Department of Laser Technologies, Center for Physical Sciences and Technology, Lithuania

[*]Corresponding author email: rodrigas.liudvinavicius@ftmc.lt

In recent years, plasmonic nanostructures have garnered significant interest from researchers due to their promising applications in various fields, including plasmonic nanolasing, surface-enhanced Raman scattering (SERS), and optical label-free biosensing [1]. The key behind this interest lies in utilizing the plasmonic effect, also known as plasmonic resonance. Traditionally, plasmonic nanostructures are manufactured using electron or ion-beam lithography techniques, however, these methods face challenges such as limited scalability, the need for expensive equipment, and specialized facilities. Recent advancements in laser-direct writing for plasmonic structure fabrication have addressed these limitations, making the production of plasmonic gratings more cost-effective and, simultaneously, more appealing for both new research and the commercialization process.

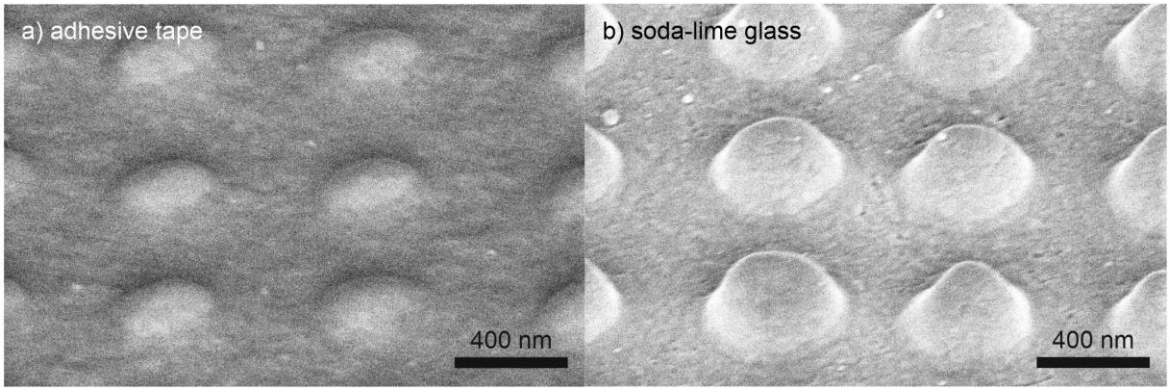

Figure 1. Microstructures formed on thin film gold film (50 nm) sputtered on different substrates: a) adhesive tape, and b) soda-lime glass.

In this study, we employed a direct laser-writing technique to create periodic micro-structures on a thin gold layer sputtered onto various substrates. The choice of different substrates aimed to assess their influence on the formation process (geometrical shape of structures) and the optical properties of the microstructure grating. Additionally, exploring the possibility of fabricating plasmonic structures on various substrates is attractive for discovering new applications. As revealed in this investigation, it was found that gratings can even be formed on flexible substrates.

References: [1] K. Yang, X. Yao, B. Liu, B. Ren, Metallic Plasmonic Array Structures: Principles, Fabrications, Properties, and Applications. Adv. Mater. 33(50), pp. 2007988 (2021).