Investigating the Topography of Discontinuous Gold Layers at the Nanoscale

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Abstract. This research aims to demonstrate the preparation of ultrathin (1.5 ÷ 15 nm) gold films with a nanostructured surface using RF diode sputtering and to determine the influence of technological parameters on their morphological and optical properties. The early stages of thin film growth, including nuclei formation, growth of clusters, and islands, dominate the growth of nanostructures. Therefore, our research objective is to verify the possibility of forming Au plasmonic nanostructures by sputtering. The sputtering process parameters such as sputtering power, substrate temperature, deposition time, and gas pressure will be systematically varied to achieve this objective. The obtained nanostructured films will be characterized by scanning electron microscopy (SEM), atomic force microscopy (AFM) and UV-Vis spectroscopy to investigate their surface morphology and optical properties. Furthermore, the influence of the thickness and size of the Au nanostructures on their optical properties, such as localized surface plasmon resonance (LSPR), will be investigated. The results of this investigation can provide valuable insights into the formation mechanism of plasmonic nanostructures by sputtering and can have practical implications in the development of novel plasmonic devices for various applications, including sensing, imaging and energy conversion.